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THE SCIENTIFIC EMBALMER

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"The Scientific Embalmer"

A Treatise Which Solves the Question of Embalming and the Puzzles of the Embalmer

"The Scientific Embalmer"

A Treatise on Judicial Embalming, throwing light on very important questions which had so far remained obscure.

By

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PREFACE

The course of studies in embalming schools is so short and so insufficient that it is impossible for any student to be a trained embalmer at the end of such a term. Some courses are limited to two weeks, others to three or four weeks, a time which is not even sufficient to learn the essential parts of Anatomy.

Hence, only the barest rudiments of Anatomy are taught, together with the mechanical part of embalming. The teachers themselves, in order to be able to explain the many diverse conditions present in different bodies and the various treatments that such conditions require, should have a thorough knowledge of Anatomy and Bacteriology, and at least a fair knowledge of Physiology and Chemistry. Such is not the case, however, except in very few schools. Consequently, the embalmer, when in business for himself, is left to his own resources and judgment, and has to gain experience at the cost of many failures.

The teaching of embalming consists in fact of two branches,—mechanical and scientific. The mechanical procedure, as taught in the schools, consists of raising the arteries, injecting the fluid, draining out the blood, aspirating the gas, etc.

The scientific branch, which is by far the most important, consists of a fundamental knowledge, which enables the embalmer to understand the conditions present in the bodies, judge of the requirements of each case, avoid the causes of failures, and thereby solve

his own difficulties. This scientific side of embalming is never taught in the embalming schools; it is a post-graduate course without which no embalmer can be successful. If after learning the mechanical management, he does not learn the scientific management, he is like a horse without a driver. No doubt the horse can pull, but he will not go far without causing an accident when not guided.

In my relations with the undertaking profession I became aware that an instructive medium of this kind was badly wanted. At the same time I realized that the embalmer did not want a long-winded affair in character and form, but a brief treatise as concise, plain and simple as possible, bearing all instructive points in a nutshell, as it were. This is what I have endeavored to make it.

THE PHENOMENON OF DEATH EXPLAINED.

The Disappearance of Life Step by Step.

Both the undertaker and physician, to be properly qualified for their work, should know and fully understand the various phases of the phenomenon of death, or the process, step by step, of the withdrawal of life from the various parts of the body. I venture to say, however, that no undertaker and very few physicians are at all acquainted with it because it was never explained before as it is in these pages, only passing mentions, no description, having ever been made by authorities on physiology. The embalmer especially should know what the conditions are in a body "dying by inches," as commonly said, and what the consequent requirements will be when he comes to embalm such a body.

The Mechanism of the Circulation.

The power house which manufactures electricity, the wires which carry this electric force away to engines, and the engine which moves from this electric force, illustrate most strikingly the mechanism of the blood circulation. In the body the brain is the power house which manufactures the energy, using the blood as fuel; the nerves are the wires which carry this nerve force to the heart (and to all other organs), and the heart is the engine which, moved by the nervous impulses, propels the blood-stream. The heart is our most active organ, but without the nervous impulses it is as inert as an engine without steam. This represents the mechanism of the circulation during normal life; now let us see how this mechanism is affected at the close of life.

In bodies dying slowly from protracted sickness the phenomenon of death is, in fact, a gradual retrogression of life from the extremities to the heart, where the last spark, as stated further on, may linger for many hours with no other outward sign than a feeble respiration, and, last of all, even without respiration. In this case the circulation of the blood could not be better compared than to a thermometer in which the mercury is the blood, the mercury bulb the heart, and the mercurial column the arteries; the approaching death representing the cold temperature, and zero meaning death. In proportion as death approaches the blood withdraws from the extremities and falls back toward the circulatory center—the heart, much of the venous blood collecting and stagnating in the veins. In such bodies, "dying by inches" as said, the voluntary functions, such as the motions of the arms, legs and head, are partially or totally abolished from one to several days before death.

This paralysis is mostly due to want of blood circulation in the motor areas of the brain and in the paralyzed parts. The bowels are usually paralyzed at the same time, or even before, from the same cause. Soon afterwards this paralysis becomes complete, the motions of the eyes, head and little fingers being the last ones to disappear. About at the same time, or just a little later, the circulation of the blood ceases to reach the frontal lobes of the brain; this wipes out the mind and means unconsciousness. Then the circulation falls back to the base of the brain, where the medulla oblongata is located. Now the brain is dead, and the body practically so, too. There is a complete cessation of both the voluntary and involuntary functions except those of the heart and lungs. The liver, spleen, pancreas, kidneys, bladder, stomach and bowels are at a complete standstill, and the special senses are also abolished, but the final struggle is yet to come.

At this critical point, the source of energy (the brain) being lost, nature uses her last resources,—its stored energy. The medulla oblongata is the nerve centre of the respiratory and heart functions, and sufficient energy is stored up in this organ to keep the heart and

lungs going for hours and sometimes for a day. Now the blood circulation is practically confined to the lungs, diaphragm, heart muscle and base of the brain, having stopped in nearly all other parts. When the energy stored up in the medulla oblongata is exhausted the heart weakens still more and the blood leaves the brain altogether. At this point it would seem that the lungs and heart should stop, but they don't; they still keep going.

Nature now falls back on its next stores of energy—the three cervical nerve ganglia, (located on the vertebrae of the neck), from which arises the second set of nerves supplying energy to the lungs and heart. These ganglia assume and continue the work of the medulla oblongata, giving off the energy stored up in them, but their capacities are small and they can keep up the flame of life for only about an hour. Then comes the struggle for breath which marks the last impulses from these ganglia, and expiration follows. Is this the end? Not yet! Respiration has ceased, but the heart still beats. The cardiac nerve ganglia, (one or two in number) which are distant offshoots of the cervical ganglia and located right above the heart, are also small stores of energy, the very last. These still keep the heart going and retain within their cells the last spark of life, like a smouldering brand covered with its own ashes. This heartbeat is, however, slow and very feeble, quite often not audible to the ears of the auscultator; the blood does not reach the lungs, and its circulation is about confined to the heart muscle. The body is now in what may be properly termed "suspended animation." The length of time that this condition lasts is very variable. It is very short, one minute or less, in bodies dying by inches, because the nerve force back of these last ganglia (the energy which was stored up in the cervical ganglia and medulla oblongata) is exhausted. In cases of sudden death it may last for hours and even one day, during which, if the vital organs have not been destroyed or disabled by injury, such as in drowning or asphyxia by gases, life may be rekindled if the proper stimulating measures are used. Drowned persons have been revived several hours after having been taken

out of the water. A slightly stronger flutter of the heart, propelling a few drops of blood to the base of the brain and medulla oblongata, suffices to thus rekindle life. A drop of blood reaching the medulla will set up spasmodic inspirations in the lungs, first at long intervals, then gradually at shorter intervals as the heart gets stronger, until finally the regular respiration is re-established.

That still condition of bodies dying suddenly in full vitality may be quite prolonged. The bodies said to have revived after having been pronounced dead or buried "alive," as claimed, are just in that condition of prolonged stillness in which only the cardiac ganglia retain a spark of life. The self-revival of such bodies can only be explained as follows: Some groups of cells of the cardiac nerve ganglia, which had not yet given off their energy, suddenly discharge their impulses collectively, causing a slight explosion of nerve force on the heart muscle. This sudden stimulus results in some strong beats which propel blood to the brain. If this blood reaches the medulla oblongata respiration is re-established, and if it reaches the frontal lobes of the brain the mind is restored and the person awakes.

This revival, however, is not always complete; but be it partial or complete there is no reliable record of its having been permanent, except perhaps in some extremely rare instances. Furthermore, the instances of such self-revival are much exaggerated. Certain women, desiring to break into conversation with an interesting topic, are prone to relate some such occurrences which, in fact, are of their own fabrication.

Now I shall refer the embalmer to a later chapter for the proper treatment of bodies which died very slowly from diseases attended with fever or from a septic condition.

THE CIRCULATORY SYSTEM.

The first step toward becoming a good and judicial embalmer is to learn well what the circulatory system is, so as to bear a constant picture of it in mind. This part is fairly well taught in certain embalming schools and only roughly in others. Anyhow, I consider it necessary to give a brief and more comprehensive description of it than is usually done, especially as to the capillaries.

The circulatory system in life is made up of four links—the heart, arteries, capillaries, and veins. In the dead body the heart plays no part; to make the fluid circulate the hand of the embalmer plays the part of the heart. Hence only the arteries, capillaries and veins are to be considered as forming the circulatory system.

Plainly speaking, the arteries are big tubes which divide and subdivide into branches like a tree, the smaller branches being called arterioles. In turn the arterioles divide and subdivide into smaller and minute branches, the minutest merging with the capillaries. The arteries are the carriers of the embalming fluid to the capillaries, as they are the carriers of the blood to the same in life.

The capillaries, more fully described in the next article, are a network of microscopic tubules more minute and dense than the finest and closest cobweb. It is in this network that the work of disinfection is accomplished by the embalming fluid. The veins are tubes as big as the arteries. During life they return the blood to the heart; at death the blood collects in them, and they also receive the surplus of the fluid which circulates beyond the capillaries. Hence the fluid circulates from the arteries into the capillaries, and, when a sufficient quantity is injected, from the capillaries into the veins.

In all parts of the body except the heart and lungs the embalming fluid follows the same course as the blood during life. In the heart and lungs it takes just the opposite course. The blood, during life, flows from the veins to the right chambers of the heart, from there to the lungs and therefrom to the left chambers of the heart, from which it ascends through the Ascending Aorta and becomes distributed to all parts of the body. On the other hand the part of the embalming fluid which goes down the Ascending Aorta follows just the reverse course. It enters the left chambers of the heart first, then passes to the lungs, returns through the right chambers of the heart, and therefrom through the Superior Vena Cava, Subclavian Vein and drainage tube.

Completing the Circuit.

The fluid which passes from the arteries to the capillaries and from the capillaries to the veins, is said to complete the circuit. The term might be more accurate, however, if applied to the fluid which returns through the drainage tube. To make the fluid reach the veins a sufficient quantity has to be injected. The fluid never completes the circuit at the same time throughout the body; this completion in fact depends entirely on the amount of fluid injected and the distance it has to travel. a free circulation being understood. The fluid may complete the circuit around the point of injection while yet injecting the second or third pint, and may not complete it in the legs until six to eight quarts have been injected. This point is explained in one of the following articles.

THE CAPILLARIES.

A Lesson on Microscopic Anatomy.—The capillary system forms a dense network through all the tissues of the body. Its meshes are so close that the interspaces between them can only be seen under the microscope. So narrow are those interspaces that the sharp point of a needle cannot pass through them. You cannot prick the skin without puncturing a capillary, as evidenced by the appearance of blood. This shows how thoroughly the living body is saturated with blood, and the dead body is certainly as well saturated with fluid when the capillaries are filled. When we realize that every cell and fibre of the flesh lie in those interspaces or

CAPILLARIES OF A LIVER LOBULE.
Highly Magnified

A—Central Vein. V—Peripheral Veins, B C—Blood Capillaries. D—Bile Capillaries.

between layers of capillaries in intimate contact with the latter can we doubt an instant that preservation will be perfect if these capillaries carry the proper fluid.

The size of the interspaces between the meshes of the capillaries varies. In the following organs their diameter is as follows:—

	of an inch
Lungs	1-2800
Mucous Lining of the Mouth	1-2200
Mucous Lining of Stomach and Bowels	1-2000
Skin of Face and Ears	1-600
Skin of Neck and Hands	1-400
Skin of other parts	1-200
Brain	1-200
Muscles, transverse diameter	1-400
Muscles, longitudinal diameter	1-200

When the entire flesh is pervaded with capillaries so close and filled with a fluid which can penetrate through all of them, would it not be insanity to fear failure of preservation?

As shown above it is in the lungs that the capillaries form the closest network, and this in fact enables these organs to absorb as much as a quart of fluid. Hence the lungs are better disinfected than any other part of the body, and it is ridiculous to ever inject the chest cavity when there is a free circulation.

The next parts best supplied with capillaries are the mouth, stomach, intestines and face. The capillaries of the mucous membranes of the mouth, stomach and bowels are the smallest in size, but very close, so that they absorb as much fluid as those of the face and ears, which are the largest but much less close.

The diameter of the capillaries themselves varies from 1-1400 to 1-3000 of an inch.

Disinfection and preservation by the fluid in death is strictly the same as disinfection and preservation by the blood in life. What the blood can do in the living body through the capillaries a suitable fluid can certainly do in the dead body.

The process by which the tissues are nourished during life and disinfected after death through the capillaries is properly termed "exosmosis." Exosmosis means that the nourishing and disinfecting principles of the blood

and embalming fluid permeate the tissues through the extremely thin walls of the capillaries without any blood or fluid escaping through the capillary walls. Therefore the whole question of preservation resolves itself into this:

1.—Inject enough fluid to fill all capillaries —not less than four quarts in bodies of from 135 to 170 pounds. (Fat does not need disinfecting. Hence, when the abnormal weight is mostly fat only the length of the body should be taken into consideration.)

2.—In your first half-gallon use a fluid possessing great disinfecting and preserving power while causing but little rigidity.

3.—Follow with a strong formaldehyde fluid to complete the work and give the desired degree of rigidity.

Such a fluid as the former will more easily remove the discolorations and, when backed by the latter, will penetrate to the remotest capillaries inaccessible to a strong formaldehyde fluid and disinfect not only the flesh but also the blood in the veins.

TABLE SHOWING BY ORDER THE SYSTEMIC CIRCULATION OF THE EMBALMING FLUID.

We have determined and timed by actual experiment the regular systemic circulation of the embalming fluid throughout the body as it flows in; i. e., the parts and organs successively reached by the fluid. Our findings, as determined by our colored fluid, are here given by order when injecting the Axillary:

Inward Flow.

1.—The big arteries, excep the pulmonary.
2.—Left ventricle of the heart.
3.—Small arteries.
4.—Left auricle of the heart.
5.—Pulmonary veins and smaller arterioles.
6.—Capillaries of the thyroid gland, nearer shoulder and lungs.
7.—Capillaries of the face, stomach, spleen, bowels. liver, kidneys and pancreas.
8.—Capillaries of the left arm.
9.—Capillaries of the legs.
10.—Capillaries of the brain.
11.—Capillaries of the bones and marrow.
12.—Capillaries of the cartilages of the articulations.

We must add, however, that the fluid, though reaching certain parts of the body long before others, becomes more or less evenly distributed by gravitation within a few hours, provided a sufficient quantity be injected..

Four quarts of fluid in a 150 pound body reach all parts from No. 1 to No. 12. Three quarts do not reach No. 10 and only part of No. 9. Two quarts only reach No. 8 imperfectly and scarcely any of No. 9.

Return Flow.

When some of the fluid comes out with the blood through the drainage tube before injecting 3½ quarts in a body of average size, it must not be taken for the general return flow from around the heart and Sup. Vena Cava, as many embalmers think. This is only a local return flow from the parts nearest the point of injection, the thyroid gland and the shoulder when injecting through the Axillary or Carotids, these being the shortest circuits.

This return flow of the fluid from the shortest circuits, which at times begins as early as while injecting the second pint, should not trouble the embalmer's mind or stop the injection, because the amount of fluid thus lost is always small.

DRAINING OUT THE BLOOD.

Draining out the blood is not necessary when practicing our system of embalming, except in the following cases:

1.—Purging. Dropsy.

2.—Obstructed circulation.

3.—Decomposition before embalming.

4.—Full-bloodedness. When a subject was full-blooded in life and died suddenly in that condition there is from 5 to 7 quarts of blood in the body. As the veins cannot accommodate this much, part of it should be drained out.

Which Parts of the Body Are Drained Out When Draining Out the Blood From the Right Axillary Vein?

This question is of the greatest interest to the embalmer and should be settled in this book conclusively. In connection with this, the influence that the influx of the fluid exerts on the outflow of the blood must be explained. This latter point is very much misunderstood because the fluid can only have an influence on the outflowing blood when and where it completes the circuit by passing from the arteries into the capillaries and from the capillaries into the veins. When it thus reaches the veins it is bound to drive the blood, or rather part of it, toward the point of issue—the drainage tube, but when and where does this take place? To determine this we have to take into consideration the location and the amount of fluid injected.

At this juncture I should emphatically assert that the first three pints of fluid, in a body of average size, cannot help in any way the outflow of blood, because three pints only fill the arteries, heart and most accessible capillaries; apt to complete the circuit only around

the point of injection. With the fourth pint, however, some fluid will complete the circuit in the head, face and neck, and therefore only at this time will the inflowing fluid have any influence on the outflowing blood. Two quarts of fluid cannot in any way move the blood, that is, start it outflowing from any part of the body except the head and neck. Three quarts, however, start the blood outwardly in the left arm, heart and lungs. Four quarts clear these parts of about two-thirds their blood contents, the head about entirely, and the chest wall partially. These are the only parts of the body from which blood is extracted in the usual draining operation.

Very little blood, usually not any at all, can be drawn out from the other parts of the body, especially when the body is in the inclined position, as is most commonly the case. Not less than six quarts of fluid are required to complete the circuit in the lower half of the body, so as to drive some blood upward through the Inferior Vena Cava. Assuredly not a drop of blood from the stomach and bowels can be brought out. This is owing to the fact that the blood, after having been driven out of the stomach and bowels by the fluid, has to force its way through the capillaries of the liver and out through the Hepatic veins to reach the Inferior Vena Cava, which is an impossibility in the usual process of embalming.

A POSITIVE INDEX AS TO THE NECESSITY OF INJECTING THE ABDOMEN.

Whenever the abdomen is sunken in instead of being bloated out, there is positively no danger of any trouble arising therefrom after a thorough arterial injection. But when the abdomen is found to be more or less bloated, especially in summer, it means that decomposition has already set in or that a septic condition exists, which necessitates injecting the abdominal cavity.

BLOOD DISCOLORATIONS.

How to Best Remove Them.

I will here explain a point of capital importance, hitherto entirely unknown to the undertaking profession, and which in fact I discovered only recently. Unsuspectingly a great mistake is being made by most embalmers in the process of draining out the blood. This is the fact that the drainage tube, even when perforated, if pushed beyond the head of the Clavicle (collar bone), interferes with the drainage and clearing up of the ear and upper part of the face of the right side, because it closes completely the opening of the External Jugular Vein which drains the skin of these parts. A great many embalmers have noticed time and again that they had more trouble in clearing up the right ear than the left one, but to them the cause of this has been one of the puzzles the embalmer has to contend with so often.

Some embalmers, either through misconception or wrong instruction, push their drainage tube even clear to the Superior Vena Cava, unaware that in so doing they also close the opening of the Internal Jugular Vein, which drains the blood from the deep parts of the head and from the skin of the face from the eye down. Any one can easily understand that with the drainage tube right in front of the openings of the veins which drain the face the removal of blood discolorations, so frequently present, especially in the ears, cannot be as easy as when the downward course of the blood is unobstructed. I should add, however, that it is especially during the injection of the second and third quarts that those veins should be open, because it is during the injection of the second and third quarts that the fluid finds its way through the face, driving the blood onward.

The head of the collar bone stands out prominently at the root of the neck and can be seen and felt by any one. If necessary the embalmer can easily measure the space from the axilla to the head of that bone so as to keep his tube back of it.

Another point of great importance is the following that no one has ever thought of before: Massaging the External and Internal Jugular veins downward along their course in the neck helps greatly in removing the discolorations of the face and ears, because this downward massage empties these veins of their blood contents. It goes without saying that these veins, which drain the face, have to be voided of their contents, when full, before any more blood can be driven into them. Begin this massaging on the face along the ear and back of the ear because this is the course of the two principal branches of the External Jugular vein. Then follow by massaging the ear and you will obtain the desired results. Confining massage to the face has been a mistake to this day.

COAGULATION OF THE BLOOD.

Certain agents going around claim that the fluid they sell does not coagulate the blood, and that all, or nearly all other fluids do coagulate it. They carry supposed samples of fluid from five or six different manufacturers, even of the best known, and, when visiting the undertakers, pour some of these fluids in test tubes containing oxblood to show the results. Then they make the same test with their own fluid to show different results. The poor undertaker, not knowing anything about the chemistry of fluids or of their physiological action, listens benevolently to that sly and gulling talk and wonders whether that is true or not. He has been so humbugged before that now he cannot distinguish a crook from an angel. In fact the devil is known to have the smoothest tongue. To protect the unwary undertaker I will here settle the question radically.

To come to the point, is there any fluid on the market which can coagulate the blood in the capillaries? I never saw any that could do it, and do not believe there is any. If there were the sale of it should be prohibited by law; but the fact is that there is no fluid that can coagulate the blood in the capillaries, for the very obvious reason that it cannot mingle with the blood in the capillaries, these being much too narrow to permit the mixing of the two.

I made a test on a discolored body with a thirteen per cent. solution of formaldehyde, which is stronger than can or should ever be used for arterial injection, and still this failed to coagulate the blood in the capillaries. Of course if the arteries were partially filled with blood certain fluids, when injected therein, would cause it to coagulate, but the presence of blood in the arteries is a very rare occurrence. The presence of blood in the capillaries of the face, however, is a very common occurrence, but the fluid usually drives this blood into the veins before it can coagulate.

In fact the blood can only be coagulated in the veins, not in small veins even, but veins of fairly large size. Furthermore, the coagulating process in the veins is always slow, because the mixing of the fluid with the blood in such narrow tubes is always slow. Pouring fluid into a test tube partly filled with so-called blood, where the mixing is very easy, is vastly different from forcing fluid into the capillaries where mixing is impossible.

Now what does it matter if the fluid coagulates the blood in the veins? In reality it is a good thing when it does, because then the blood cannot flow back into the capillaries and cause a black face, for the simple reason that coagulated blood cannot circulate.

Therefore all that talk about fluids coagulating the blood in the capillaries is "all rot." Vulgar as this expression is, it characterizes better than any other words those deceptive arguments calculated to blind the unwary undertaker who hungers for the truth.

DISINFECTION OF THE BLOOD.

How Is the Blood Best Disinfected?

I do not share in the advocacy of injecting fluid into the veins to disinfect the blood. It is considerable extra work to do so and very few embalmers care to assume the task. Moreover, I question the necessity of resorting to such a practice because the blood is much better and much more uniformly disinfected by injecting a sufficient quantity of fluid into the arteries. In fact, the arterial injection disinfects the blood in two different ways, as follows:

First, the walls of the veins have capillaries as well as all other tissues of the body, and the fluid gets there by the arterial way as to all other parts. This disinfects the blood sufficiently in the small veins, and to some extent in the big veins. Second, when the arterial injection has filled all the capillaries of the body with fluid the latter flows from the capillaries into the small veins, and from the small veins into the big veins where it mingles with the blood, the large veins having tributary branches all along their courses.

Hence all the veins of the body receive fluid from the arterial injection, whereas only a few can receive any from a venous injection, because the veins are mostly filled with blood that the fluid, to find its way in, has to displace and drive onward before itself.

INJECTING A WEAK SOLUTION BEFORE THE EMBALMING FLUID.

Its Advantage and Disadvantage.

The practice of injecting a weak solution in the arteries before the real embalming fluid is widespread though its advantage be counterbalanced by a disadvantage. The question is of such a great importance and interest to the undertaking profession that I will here analyze it from its very bottom.

The object sought by that procedure is to wash out the tissues before causing rigidity. The idea is good and the object accomplished provided that not less than a quart of that solution be injected. At this point, before going any further into the question, I should remark that the majority of those who practice this method do not understand it fully, as many of them stated to me that they injected only a pint of that weak solution. Assuredly those who only inject a pint to accomplish the object sought are not sufficiently acquainted with the anatomical conditions, because not a teaspoonful of the first pint can find its way to the face, for which it is intended, except in small bodies. They do not realize that the first fluid injected cannot but follow the most direct course, and that furthermore its most direct course leads to the broadest arteries, into which it flows most readily, and which it must fill up before it can force its way through the narrow arteries and capillaries of the face. The direct course of the fluid when using the Axillary Artery is both the Ascending and Descending Aorta and the Left Subclavian Artery leading to the left arm. The Ascending Aorta leads into the left chambers of the heart; the Descending Aorta into the lower big arteries.

The fluid can never penetrate into the capillaries until arterial tension has been produced.

To produce arterial tension the arteries and left chambers of the heart have to be filled up, and one pint does not fill them. One pint only fills the big arteries and heart. A second pint will, however, produce a slight arterial tension, as now the fluid penetrates in the small arteries, and this tension will be sufficient to force some of the solution into the nearest and most accessible capillaries,—those of the face and neck. Therefore it is safe to say that when injecting only one pint in a body of average size, not a teaspoonful of it finds its way to the face, which is the sole object of the whole procedure.

This settles one phase of the question, and I will now take up the other side and explain the disadvantage of the procedure.

The users of this method agree that the weak solution has no preserving action, but they claim that it is driven out through the drainage tube by the embalming fluid injected afterwards. This claim is all wrong and positively unfounded. It should be emphatically stated that, in the way embalming is usually done, not one-twentieth part of that weak solution can be driven out through the drainage tube. If, for instance, the injection is made through the Axillary Artery, only about one-fourth of the part of that weak solution that goes through the right shoulder, neck and head, will complete the circuit through the capillaries, veins and the drainage tube. The bulk of the solution, which goes down to the other parts of the body, can never be brought back, even by injecting six quarts on top of it. The arteries, capillaries and veins below the neck will absorb as much as six or seven quarts of fluid, before yielding any or very little through the drainage tube. This point is not sufficiently realized by the profession at large.

Some of that weak solution, however, but not more than one-tenth of it, that is to say, the part that reaches the veins through short circuits, could be made to gravitate towards the drainage tube by raising the lower part of the body higher than the level of the shoulders and keeping it in this position for several hours. But where is the embalmer who will go to such a trouble? All the more so that this is impracticable in private residences. Furthermore, this position of the body interferes with the

circulation of the fluid toward the legs and causes fluid congestion and puffiness in the face.

Therefore that weak solution, which cannot preserve, remains in the body and fills the place that should be occupied by a good preserving fluid. If, however, the embalmer injects plenty of strong fluid on top of that weak solution he may feel safe, but if he confines himself to two quarts he is doomed to meet with frequent failures, unless he injects the abdomen thoroughly with concentrated undiluted fluid.

The Advantage of Using a Strong Fluid Causing But Little Rigidity in the First Injection.

To realize the advantage of using a strong fluid causing but little rigidity in the first injection one must bear in mind the three following points:

1.—That the first two quarts of fluid injected have to do most of the work of preservation, because the subsequent quantity injected drives them foremost into the capillaries.

2.—That it is in the capillaries that the whole work of preservation is to be accomplished, because the capillaries are a dense network very closely interwoven with the fibres of the flesh. Their walls, being extremely thin, permit the fluid to exert its preserving action on the flesh without escaping from the capillary walls.

3.—That the last quart injected remains in the arteries and left chambers of the heart almost wholly, therefore having but little preserving action.

Conclusion.—Therefore, when the first fluid injected, which is to accomplish most of the work of preservation, causes but little rigidity it can easily penetrate and saturate the entire mass of flesh; and when such a fluid is at the same time a very strong disinfectant and preservative it effects a thorough disinfection and insures permanent preservation.

Hence if a strong fluid can be found that will accomplish the same results as a weak solution and disinfect at the same time, the same advantage will be gained without the disadvantage. If you never heard of such a fluid, my dear embalmer, see Paraform through the index.

TISSUE GAS.

Facts That Should Be Known to All Embalmers.

What is tissue gas? In what part of the microscopic anatomy does it develop and collect? Why is it impossible to aspirate it except very imperfectly? These various points have never been fundamentally explained, and must be described here to enable the embalmer to understand the condition present, and what is to be done to meet the case. Tissue gas is the product of flesh decomposition, and has no relation whatever with intestinal gas, which is the product of fermentation of the contents of the bowels. The embalmer can easily cope with the intestinal gas; not so with tissue gas. One can aspirate intestinal gas, but very little of the tissue gas.

In order that the embalmer may understand well the above questions, it is indispensable that he should have a clear conception of the construction of the tissues, as described in the following:

The whole mass of soft tissue of the body is made up of layers, and each of these layers itself consists of other slender layers of cells and fibres. All these layers are in intimate contact, flattened, as it were, on top of each other. Each muscle forms a layer by itself. The skin is a layer by itself, consisting of two coats—the scarfskin or epidermis, and the true skin or cutis. The walls of the stomach and bowels have four layers or coats from beginning to end. The wall of the abdomen, from the skin to the internal lining or peritoneum, has not less than six principal layers, without counting the network of capillaries and lymphatics in them. This includes the skin, fat, several muscles and the peritoneum. All these layers are loosely connected by other very slender layers of connective tissue.

In addition to that, we must bear in mind that all these layers and every organ are made up of an infinite number of cells and fibres, so small that they can only be seen under the microscope, and that every one of these cells is

separated from the other cells by a very slender film of areolar tissue, (a form of connective tissue.)

Now, my dear embalmer, if you have that well in mind, the next question is, Where does tissue gas develop and in what part of the minute anatomy does it collect? It develops in the interstitial spaces, that is to say, in that loose areolar tissue. In other words, it collects between the various layers of tissue and between the individual cells, forming vesicles of gas varying in size from one fiftieth of a pin's head to a pea, which later, by coalescence, may grow to the size of a pigeon's egg. When, after a body has been dead for forty-eight hours or longer, the skin is found to "slip off" under the pressure or rubbing of the embalmer's fingers, it means that gas has already formed there and collected between the two layers of the skin, loosening the scarfskin from the true skin. This is the reason why, in such a case, the scarfskin comes off so easily. Blisters forming in the skin are not always water, but often gas.

Why Is Disinfection So Difficult in the Presence of Tissue Gas?

Tissue gas is continuous over large areas, but broken up, as already stated, into an infinite number of minute pockets or subdivisions, like vesicles or bubbles, inclosed in a film of areolar tissue. To better realize what tissue gas is, take, for instance, a bottle partly filled with water and shake it well. You will then see through the water a great number of minute bubbles which gradually rise to the top. Imagine an accumulation of such vesicles filled with gas, pressed close together so as to form a layer between the capillaries and the tissue cells, and you will have a true picture of the condition present in the body in the case of tissue gas.

The fact that this mass of gas is so subdivided into minute vesicles explains why it cannot be aspirated, except to some extent in parts which contain a distinct accumulation thereof.

A great misconception exists among embalmers in regard to the gas present in the chest cavity. The general idea is that gas may be collected there in large pocketfuls, as in the bowels, and that it can be aspirated from there as well as from the bowels. Tissue gas is the only gas which can develop in the chest cavity, and it develops in the lung tissue especially. There it forms in small vesicles, as stated above, varying in size from 1-50th of a pin's head to a pea, which, days or weeks later, may grow to the size of a pigeon's egg. The trocar, by aspiration, can only bring out the gas contained in the vesicles it breaks through.

Now, to come to the point, the embalmer must realize that, in order that the fluid may exert its full preserving action on the flesh, the capillaries containing the fluid must be in intimate contact with the tissue cells. They are not in contact when tissue gas is present, because as already stated, this gas is collected in the loose areolar tissue between the capillaries and the tissue cells. This is what, in such a case, renders the task of disinfection and preservation so difficult and elaborate.

How to Recognize Tissue Gas.

The next important question to the embalmer is, What are the outward signs indicating the presence of tissue gas? This leads to the question, What is the odor arising from a dead body? This odor is simply tissue gas finding its way out. But, in fact, gas begins to form in the tissues from two to forty-eight hours before it can find its way out, so that it will be present there long before it can be detected by its characteristic odor.

In all diseases attended with fever tissue gas formation begins at death just as the heart ceases functioning. In certain cases, especially in septicemia, peritonitis, typhoid fever, typhus fever, scarlet fever, puerperal fever, yellow fever, diphtheria, croupous pneumonia, cholera, bubonic plague and smallpox, when the heart becomes so feeble that it cannot propel the blood to all parts of the body ,tissue gas begins to form even before death in the skin and other parts where the circulation ceases one or several hours before death. This ac-

counts for that "slipping off" of the epidermis soon after death.

The signs indicating the presence of tissue gas, given by order as they appear, are as follows:

1. A marked or excessive bloating of the abdomen.

2. A distended and abnormally resounding chest.

3. Swelling of the neck.

4. Skin-slip.

5. Later, the characteristic odor.

A distended abdomen means that tissue gas is present not only in the abdominal cavity, but also in and between the various layers of the abdominal wall. Tissue gas also forms in the bowels from the intestinal tissue, and thus mingles with the intestinal gas. A bloated abdomen, however, unless associated with some other sign, is not a positive or invariable symptom of tissue gas because the bowels may be extremely distended with intestinal gas alone.

The distension of the chest is not very apparent, but, upon knocking thereon, it is found to be more resonant than normal, due to an accumulation of gas therein.

The neck becomes swollen from two causes. First, gas forms and accumulates there because the skin is more loose than in any other part of the body. Second, because the apexes of the upper lobes of the lungs, already distended with gas and air, are crowded clear up into the neck by the gas pressure from below, especially the pressure from a distended abdomen, which crowds the lungs upward. If the fingers of the embalmer are pressed on this swollen neck they will evolve a light, crepitating or crackling sound, and percussion will evolve a light-hollow sound, or at least a sound much less dull or full than in the absence of gas.

The third sign of the presence of tissue gas is the loosening of the epidermis or scarfskin, which, as commonly said, "slips off" under the fingers of the embalmer.

The last and later sign of tissue gas is the characteristic odor of decomposition.

How to Treat the Case.

Now, the vital question, How to treat a body when tissue gas is present, which means that decomposition has already set in:

In this connection remember that it is easy to prevent decomposition from setting in, but that it is difficult to stop it when it has already set in. The latter can be done only by radical means. Proceed as follows:

1. Aspirate the gas from the abdomen by thrusting your trocar into the descending colon, and, if necessary, into the tranverse and ascending colon. (When the abdomen is greatly distended the gas should be let out before the arterial injection.)
2. Drain out the blood by means of the drainage tube in the Axillary vein.
3. Inject arterially from four to five quarts of a formaldehyde fluid, or as much as the body will absorb in forty minutes.
4. Puncture thoroughly with the trocar all parts swollen with gas, especially the neck, to the extent of making four punctures to the square inch. Then press upon the part with the fingers. This will release most of the tissue gas.
5. In addition inject one or two bottles of a concentrated formaldehyde fluid undiluted into the abdominal cavity. Fluid diluted as for arterial injection will not do in this case; it has to be full strength.
6. When the skin is found to "slip off" it should be bathed with a formaldehyde fluid. This will prevent further gas formation therein, hence further loosening of the epidermis.

In most cases the chest cavity may be injected by way of the throat by passing a rubber tube through one of the nostrils, or through the mouth before the arterial injection. In this case a half pint of concentrated fluid will suffice. Injecting the lungs in this way, however, is liable to cause frothing from the mouth or nose on the following day, as explained further in the article on frothing.

A body treated in this way will never turn bad and you can sleep in peace. The embalmer who cannot recognize the presence of tissue gas and is stingy with his fluid is doomed to be a failure in his profession.

DECOMPOSITION SETTING IN BEFORE DEATH.

The Necessity of Treating a Dead Body According to Its Condition—A Uniform Rule to Be Condemned.

A point of capital importance upon which I cannot lay too much stress, is the fact that certain bodies begin to decompose before death, and that many patients are choked to death by tissue gas and a bloated abdomen. How many embalmers know this to be a fact? I venture to say very few. It should, however, be known to all. Undertakers have not the opportunity of studying patients before they die, because their duties only begin at death, but I, as a physician, have had unusual opportunities in hospitals and elsewhere to study the physical conditions of patients in the last days of life. I also have had the opportunity of dissecting bodies that I had under observation before death.

Every embalmer should bear in mind that in all cases in which decomposition began before death, a not uncommon occurrence, the formation of tissue and intestinal gases cannot be controlled by the ordinary embalming; such bodies have to be treated more thoroughly. On such occasions especially the embalmer should fully realize that while certain bodies can be kept with two quarts of fluid in the arteries, others necessitate from four to six quarts besides injecting concentrated undiluted fluid in the abdominal cavity. After reading the following explanation I hope that no embalmer will make the mistake of adhering to a uniform rule as to the quantity of fluid he should use regardless of the condition in which the body is.

In certain cases the agony of the sick is prolonged for days or even weeks. When this occurs the heart becomes gradually weaker and weaker until it can no longer pro-

pel the blood to all parts of the body. This means that the circulation stops in certain parts long before death, a time which varies from a few hours to a few days. The parts in which the circulation ceases first are the extremities and the skin of the whole body except that of the head, neck and shoulders. Time comes that only the lungs and heart are alive, and barely so, the circulation of the blood having stopped in all other parts, and this condition may last from one to twelve hours. It occurs that the legs, arms, skin and certain parts of the abdomen have been dead for 24 or 48 hours before the last expiration. Bacterial life begins as soon as animal life ceases. The oxygen of the blood being the only thing which prevents the growth of the bacteria of putrefaction, it is clear that decomposition will begin in the parts in which the circulation stops, though the rest of the body may still be alive. This accounts for the "slipping" of the skin in certain bodies soon after death. The peritoneum, omentum and the walls of the bowels also often begin to decompose before death.

In such cases, tissue gas having formed extensively long before death, plenty of fluid must be injected arterially, and one or two bottles of concentrated undiluted fluid, our "Glacial" cavity fluid preferably, be injected into the abdominal cavity. Moreover, to prevent skin-slip, which is unavoidable in such cases no matter what fluid is used, because the scarfskin has already been loosened from the true skin by the gas formed between these two layers, the skin should be bathed with a strong fluid, such as "Glacial" or Ozoform, half and half with water.

The embalmer who does not heed this lesson and gets a skin-slip or bloating of the abdomen after embalming should only blame himself. A body in which tissue gas is present cannot be disinfected sufficiently by arterial injection. The abdomen and the skin must absolutely be treated as stated above. The embalmer should realize that he has a duty, a real duty to perform, and that it is too easy and a very cheap excuse to blame his failures on the fluid when he does not inject enough of it to reach all parts of the body, or fails to inject the pure

concentrated fluid in the abdomen when necessary.

Learn this lesson by heart, my dear embalmer, and you will never have any failures.

THE VARIOUS CAUSES OF THE FACE TURNING BLACK.

Draining Out the Blood Rendered Unnecessary.

As is well known, the face turning black, either before or after embalming, is the result of a back flow of blood from the veins to the capillaries. Normally the veins can hold and retain all the blood, except in full-blooded bodies, but there are causes which interfere with their capability of retaining it. One of the principal causes is a formation of gas in the big veins from decomposition of the blood by the Bacillus Albus Cadaveris. This gas, to make room for itself, displaces the blood and forces it back into the most accessible capillaries, which are those of the face and neck. The next most common cause of the face turning black is a strong formaldehyde fluid used in the first injection, and here are the two reasons:

1.—When a strong formaldehyde fluid is injected at the outset, the muscles, becoming rigid early, press upon the veins and reduce their capacities.

2.—The veins, like the arteries, have a layer of circular muscular fibres in their walls, which under the action of a strong formaldehyde fluid, contract and narrow the lumen of the veins.

When thus narrowed and compressed by rigid muscles the veins cannot hold more than half of the amount of blood they contain otherwise, and consequently, part of it is forced

back into the most accessible capillaries, such as those of the face, neck and ears. This accident is bound to occur whenever there is much blood in the body and this is not drawn out. Such a thing, however, does not happen when the first fluid injected does not reduce the capacity of the veins by causing excessive rigidity.

A profuse formation of gas in the abdomen is also a cause of a back flow of blood to the face, because a distended abdomen exerts an upward pressure upon the Inferior and Superior Venae Cava and heart. This pressure forces the blood contents of these vessels upward. This occurrence can be prevented by injecting in the abdomen a full bottle of concentrated undiluted fluid after letting out the gas.

Purging from the lungs is another cause of the face turning black. By enumeration we therefore find four causes of a back flow of blood to the face, viz.:

1.—Formation of gas in the veins.

2.—Purging in the chest.

3.—A profuse formation of gas in the abdomen.

4.—The use of a strong formaldehyde fluid in the first injection without draining out the blood.

The new system of embalming that I inaugurated two years ago, and which is described further on in reference to Paraform, does away with three of these causes, and the fourth cause is taken care of by a bottle of "Glacial" in the abdomen. The great majority of embalmers dislike horribly to drain out the blood, because it is an irksome task and takes up much time. For the benefit of these embalmers, and to summarize matters into a nutshell, I should give the positive assurance that if a minimum of three quarts of fluid are injected in the arteries and a bottle of "Glacial" in the abdomen they can safely dispense with draining out the blood, except in dropsy, full-bloodedness, want of circulation, and early fluid purging. This procedure simplifies the task of embalming considerably.

DISCOLORATIONS.

A Description and Causes of All Discolorations Which May Appear On Dead Bodies— Bacterial Colors. Chemical Colors. Disease Colors and Blood Colors.

I will here explain the various discolorations observed on dead bodies, at times before, at others after embalming, many of which have to this day puzzled the embalming world.

1. The most common discolorations is the presence of blood in the capillaries, blood which failed to flow into the veins at death and stagnates in the skin of the face, ears, neck, etc. The causes which retain this blood in the skin are the following: Congestion, local inflammation or disease, bruises or other injuries, full-bloodedness, and alcoholism. These discolorations can usually be removed by the arterial injection aided by massage.

2. As to the face turning black one or several days after embalming, which is the worst mishap that may befall the undertaker, it is due as is well known, to a back flow of blood from the veins into the capillaries of the skin. Many explanations so far given of the causes of this back flow have only been mere suppositions. The various causes of this occurrence have been given in the preceding article, the most common one being the formation of gas in the big veins, produced by the Bacillus Albus Cadaveris, which decomposes the blood. When an insufficient amount of fluid is injected arterially it does not reach the veins, and, therefore the blood therein is not disinfected. As a natural consequence gas forms there, and this gas has to displace the blood in order to make room for itself. The capillaries of the face and neck, being the most capable of dilatation, are the most easily invaded. This never occurs when a sufficient quantity of fluid is injected to reach the veins and produce arterial tension by filling all capillaries.

3. It is well known among bacteriologists that certain bacteria, technically called "Chromogenic bacteria," produce a color. Each kind of these bacteria has the power of producing a definite color. For instance some produce green pus, others yellow pus, others blue pus, and still others white pus. Certain bacteria produce a color without pus, and the color they produce varies according to the medium in which they grow. These are the kind which can produce abnormal colors before embalming, such as greenish, brown, purplish or lemon color. These same discolorations also appear soon after an imperfect embalming.

4. The abnormal colors which have been observed many a time hours or days after embalming are the result of chemical incompatibility between the particular fluid used and the toxin present in the tissues. The greenish color produced by a formaldehyde fluid in jaundice cases is too well known to deserve more than a passing mention. This greenish color results from the effects of formaldehyde on the bile-pigments.

5. When the skin turns dark, black or coppery it indicates the presence in the skin of a certain bacterial toxin which, under the influence of light and temperature, becomes oxidized (chemically allied with oxygen taken from the air by absorption).

6 **Discoloration of the lips.**—It occurs frequently that one or two days after embalming the lips turn black. What is the cause of it? It was only by means of the microscope and chemical analysis that I was able to discover the real cause of this phenomenon, which I will explain as follows: The lips have a greater blood supply than any other tissue of the body except the lungs. This is due to the fact that the capillaries in the lips are both extremely minute and extremely dense, the interspaces between them being only 1-2200 of an inch and their diameter about 1-3000 of an inch. For this reason the blood, at death, cannot withdraw from this tissue as completely as it does from the other tissues of the body, and what remains therein becomes oxidized from the oxygen of the air. This is made possible

only by the fact that the covering of the lips is no real skin, but only epithelium, which is as thin as the scarfskin.

To prevent this oxidation and blackening of the lips, see Balmrose, per index.

7. The black color appearing on dead bodies in an advanced state of decomposition is that of decomposing blood driven into the capillaries of the skin by the gas forming in the big veins.

8. In typhus fever, commonly known as "Spotted Fever," a rash, or eruption of red spots, appears on the body, especially the face, chest and abdomen. This rash, being hemorrhagic, does not disappear at death and no fluid or massage can remove it, but a strongly colored fluid may even up the color.

9. The peculiar color produced by yellow fever, which, at death, may be found to be a yellow, olive or mahogany tint, I shall explain as follows: The yellowness, which appears in the first stage of the disease and becomes more and more pronounced as the disease progresses, is a jaundice resulting from the entrance of bile into the circulation, and the deposit of bile-pigments in the skin. The primary cause of jaundice in yellow fever is the swelling and fatty degeneration of the liver. The olive color which sometimes occurs during the second or third stage, is an alteration of the yellowness caused by uremia, the kidneys being seriously inflamed the urea is not excreted and mingles with the bile-pigments in the blood. The mahogany color at times seen results from the admixture of a third element—free heamoglobin or blood-pigment, which, owing to the destruction of the red-blood corpuscles, separates from the latter, combines with the blood-serum and appears in the skin from cutaneous hemorrhages.

The colored fluid I manufacture can remove the yellowness and improve the olive color, but cannot alter that mahogany color.

10. **Purpura.**—Local, but more or less extensive discolorations of the skin, red, yellow, brown or black, are rather common, and result from extravasation of blood in the skin before death. This is technically termed "purpura." These discolorations are really hemorrhages into the skin. In certain diseases various parts beneath the skin or in the skin itself become diseased and this results in the rupture of capillaries therein and consequent oozing of blood into or beneath the skin. This blood being no longer in the circulatory system coagulates and stagnates there. If death ensues before that blood has been reabsorbed by the lymphatics, the discolorations remain to puzzle the undertaker and they grow rapidly darker or black. These purpuric discolorations vary in size from spots to large patches, and have been observed especially in the following diseases: Chronic rheumatism, septicemia, pyemia, typhus fever, scarlet fever, measles, smallpox, malignant endocarditis, snake bites, and, more rarely, in certain cases of Bright's disease, Hodgkin's disease, scurvy, tuberculosis and debility of old age.

Patients dying of scarlet fever are always badly discolored, and these discolorations, being extravasated heamoglobin from the blood, cannot be removed satisfactorily by the arterial injection; external applications are necessary to improve the complexion sufficiently.

The so-called "chemical changes" which take place in the dead body are not really chemical changes but a bacterial transformation. When animal life leaves the body bacterial life takes its place immediately unless a thorough embalming is done, and the body grows into a mass of bacteria, every bit of flesh becoming bacteria. The only real chemical change which can take place in a dead body is the oxidation of its surfaces, especially the lips, under the influence of light, air and temperature. It is by oxidation that the lips turn black, and it is also by oxidation that the drying tissues of the other parts of the body in later stages, turn black. The lips turn black sooner because their covering is greatly thinner than the skin.

OBSTRUCTED CIRCULATION.

The failure to obtain a free circulation is so rarely due to the presence of blood-clots in the arteries that this case is hardly worth considering. Furthermore, blood-clots could not affect the general preservation because they can only obstruct one or two minor arteries. Clots lodging in the Facial arteries would, however, affect the complexion of the face, and therefore this eventuality must be considered. The liability of the Facial arteries getting clogged up can arise only from using the Femoral to inject the fluid, because from the Femoral artery to the face there is quite a distance for the fluid to travel, and along this course clots may be picked up and carried along. When injecting the Axillary, Brachial or Radial, however, such an occurrence is impossible, because if any clots happen to be on the tract between the point of injection and the Carotids, the first half-pint of fluid will pick them up and carry them along to just where the first pint goes, that is, down the Ascending and Descending Aorta. The first fluid injected can never ascend the Carotids; this should be stated in no unmistakable terms. For a more detailed statement see the article on "Injecting a weak solution."

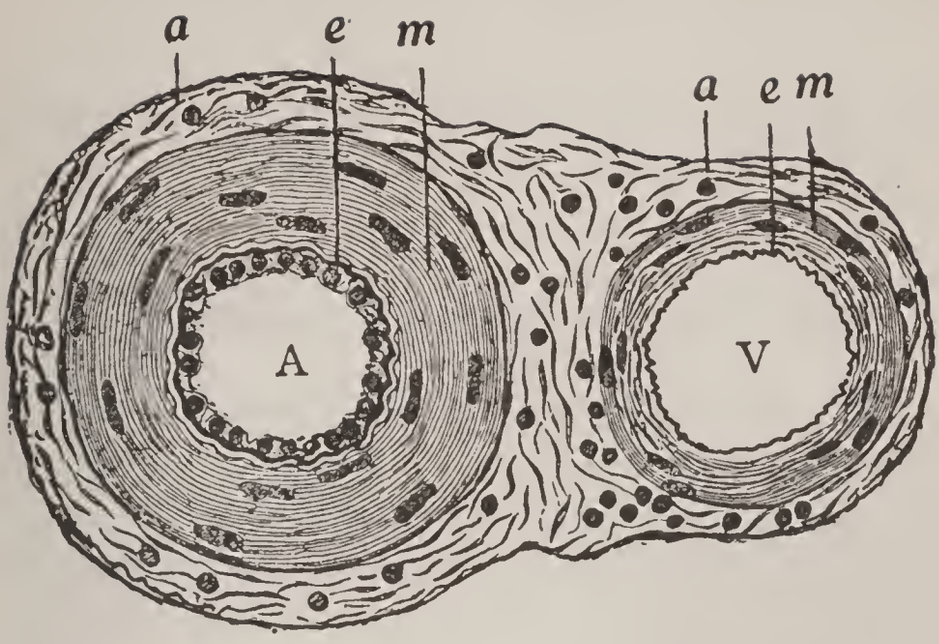
The failure to obtain a free circulation is due to one or several of four causes, namely: a clogged up tube, arterio-sclerosis in very old bodies, the use of a strong formaldehyde fluid in the first injection, and the presence of blood-clots.

By far the most common of these four causes is a tube clogged up with foreign matter or blood-clots. Therefore, whenever you find great resistance to your pumping, make it a rule to first examine your tube.

The most common of the other causes, as far as I know, has never been mentioned by any one before, and, for this reason, I wish to lay special stress upon it. I directed my studies and experiments on this subject only recently.

A physiological fact unknown to embalmers and never taught in embalming schools, is that the nerves and muscles do not die at "death", for they survive yet for a time. What we call "death" after expiration is not the death of the tissues, but a complete functional inertia from want of circulation of blood. It is the blood alone which keeps the tissues active. As soon as it ceases circulating the tissues cease functioning and become inert, but they are not dead, for they are capable of stimulation by electricity or formaldehyde. In fact the tissues die only when the nuclei of their cells disintegrate from decomposition.

Now to understand what follows let us state that the walls of the arteries and veins contain a layer of circular muscular fibres and that these fibres are under the immediate control of the vaso-motor nerves. These nerves, by stimulating the muscular fibres cause contraction, narrowing of the lumen of the arteries and veins, thus keeping up the blood-pressure in the living body. What occurs during life through nervous impulses from the brain occurs after death through the powerful stimulation of a strong formaldehyde upon these vaso-motor nerves. The only difference is that now, instead of blood-pressure we have fluid-pressure, and this pressure is all the greater that the formaldehyde is stronger. What occurs then is just what occurs during life. The vaso-motor nerves in action stimulate the muscular fibres of the arterioles into contraction. Formaldehyde being a powerful irritant, and certain nervous systems being more susceptible to its action than others (the same is true of other drugs), those most susceptible will excite such contractions as to close the arterioles, and thus stop the circulation early.



Small Artery and Vein Magnified.

A.—Artery. V.—Vein.
a.—Adventitial coat.
m.—Muscular coat.
e.—Endothelial elastic coat.

By the same action, but later, the muscles becoming rigid do not yield readily to the onward pressure of the fluid in the capillaries. Contrarily to general ideas, however, the rigidity of the muscles cannot shut up the capillary circulation entirely because the fibres of the muscles are longitudinal, whereas the muscular fibres of the arterioles are circular. This

Hence a mild formaldehyde fluid should be used in the first half-gallon to avoid that untimely and excessive contraction of the muscular fibres of the arterioles. It is quite safe, however, to use a stronger formaldehyde fluid in the second half-gallon.

When you fail to obtain a free circulation my advice is to inject the abdominal and chest cavities thoroughly with concentrated fluid, bathe the skin with fluid and pack the mouth with cotton impregnated with fluid. Nothing is gained by injecting the brain, unless the body is to be shipped across the ocean.

HOW TO RECOGNIZE JAUNDICE.

It is very important to distinguish a yellow complexion from the yellowness of jaundice, because the quantity of Coloring Compound required to just beautify a yellow complexion will not suffice in yellow jaundice, and the quantity required for yellow jaundice might make the face too pink in the absence of real jaundice.

An ordinary yellow complexion is natural, though it becomes more marked at death, is darker than yellow jaundice, and the color of the face is always somewhat different from the color of the rest of the body.

On the other hand the yellowness of jaundice, which is due to the presence of bile-pigments in the skin, is a strong lemon color uniform throughout the body. This yellowness is also very plain and strong in the white of the eyes, and makes the differentiation easy, for in the case of yellow complexion the whites of the eyes can only be faintly yellow. Therefore look into the white of the eyes to recognize jaundice.

For the removal of the yellowness of jaundice, see page 91.

FROTH IN THE MOUTH OR NOSTRILS MISCONCEIVED CAUSES.

A misconception of many embalmers, which should by all means be corrected, is the idea that froth issuing from the mouth of a dead body means every time that there is gas formation in the lungs or stomach and that the froth is itself gas. While it is true that gas and froth will result from decomposition it is not less true that froth may appear in the mouth and nose in the complete absence of decomposition. In fact this occurs quite often in the case of drowned persons when the body has not been long in the water. In such cases froth at times appears in the mouth and nostrils from twelve to twenty-four hours after the body has been embalmed, even if the embalming has been done early and very thoroughly. Very often the same thing occurs when fluid has been injected into the lungs through the mouth or nose.

What is the real cause of that frothing? This is a matter of physiology and I will give the explanation physiologically. The last expiration does not expel all the air from the lungs; far from it. In fact from one to three pints of air remain in the lungs after death. The trachea (wind-pipe) and the bronchi remain completely filled, and the bronchioles and small air-vessels partially so. Water or fluid running down the trachea after expiration imprisons this air left in the bronchi and bronchioles. Subsequently when the embalming is done, the fluid from the arterial injection fills the lungs under pressure to about their full capacity. This filling up of the lungs places the bronchioles under pressure, and the air in them is gradually but very slowly squeezed out. The water or fluid in front of this air is already mixed with the mucus always present in the lungs, which renders it consistent enough to permit of bubble formation. The air having to pass through it carries along an envelope of that mucous fluid and appears at the point of issue in the form of froth.

A LESSON ON BACTERIOLOGY.

There are three orders of life in this world, or, to be strictly accurate, life as a whole is made up of three stages, namely; animal life, vegetable life and bacterial life. The bacterial order has been represented as belonging to vegetable life, but it is so different in form, growth and purpose that it must be regarded as an independent order. The animal and vegetable bodies are multicellular, that is, made up of a vast agglomeration of cells. The bacterial order is uni-cellular, consisting of a single cell.

In the natural course of things those three orders of life prey and feed upon each other. The animal family feeds on vegetables and, incidentally, eats and digests many billions of bacteria a day, because bacteria are in and on everything and cannot be avoided. Finally when animal life has run its course the bacteria take hold of its remains, absorb them, the body becomes a mass of bacteria; this mass resolves itself into soil, the vegetable family absorbs from the soil these cast off elements of life, turns them into eatables, the animal family feeds on these eatables and transforms them again into animal flesh. This is in fact a perpetual go-round, merry or not merry.

Were it not for bacteria the dead animal or vegetable matter would only dry up and never decompose. As a consequence the soil, not getting back the vital principles it gave out, would soon become exhausted and sterile, and its sterility result in the extinction of life. Hence those three orders of life, animal, bacterial and vegetable, are inter-dependent and indispensable to each other. They in reality form a chain of three links which, if broken, would mean extinction to all three.

But there cannot be transmutation without death. That is to say, in order to transmute

from animal to bacterial life we have to die, and to transmute from bacteria to vegetable our bacterial life has to end, and to transmute from vegetable to animal life the vegetable dies, is eaten up, digested, absorbed and transformed into flesh anew, its former state, to, later, die again and thus go round indefinitely. Hence, strictly speaking and looking at nature in its crudest form, we live three successive lives—animal, bacterial and vegetable. Our bacterial life is an intermediate transition, and only a means of transmutation from animal to vegetable life, and our vegetable life is also a transitory stage, a means of getting back to animal life, to which flesh could return in no other way.

This is a bare scientific fact; not a theory, but a crude fact, strictly natural metamorphosis. I realize that life and bacteriology were never explained in this way before, and, no doubt, superficial observers will call this a queer way of looking at things, but it is nevertheless truer than anything ever written.

Animal life was the primary, ultimate and sole object of the Creator, but to make the existence of animal life possible he created the vegetable and bacterial orders,—the vegetable to support it and bacteria to permit of its rejuvenation or renaissance by decomposition and recomposition. This expression "decomposition and recomposition" fits best in the case and represents strictly the truth, though it could also be properly termed "decomposition, vegetation and re-incarnation." The whole process from beginning to end is a matter of cell activity and animal chemistry, in contradistinction with ordinary chemistry.

So far the historians have divided nature only into animal and vegetable kingdoms. The bacterial kingdom, however, must be recognized, and given a place in natural history, if I have to be the first one to place it there, as a realm by itself. The bacterial kingdom is entirely independent of the animal and vegetable kingdoms, though closely related. Both of the latter, in order to become rejuvenated, have to shed their old dust into the bacterial kingdom through the portals of death.

Bacteria Classified.

Bacteria, microbes, germs, micro-organisms, parasites, fungi, schizomycetes, germ life and germ-flora, are all synonyms and mean the same thing. There are three principal morphological species of bacteria, namely: The "coccus," plural "cocci," which is spherical in form; the "bacillus," plural "bacilli," which is a straight rod, and the "spirillum," plural "spirilli," which has the form of a twisted rod. Some bacteria have flagellae,—slender, whip-like processes, which give them some motility, though not belonging to animal life.

Bacteria are colorless bodies, consisting of a single cell. They vary in diameter from 1-250 to 1-40,000 or an inch. The largest are the bacillus of Tetanus (lock-jaw), the bacillus Cadaveris (decomposing the Cadavers), and the spores of Anthrax. The smallest are the bacilli of Influenza and Proteus Vulgaris.

Bacteria are divided into two principal classes, namely: Pathogenic and saprophytic. Pathogenic means causing disease, that is to say, attacking the living body, or, to be strictly exact, developing in and from living tissue, decomposing living tissue. Saprophytic means not causing disease.

The pathogenic bacteria cause a focus of disease in one or several particular parts of the living body. The disease thus caused, though localized, may affect the whole system, because the germs produce a virus or toxin which is absorbed and passes into the general circulation. When this poison reaches the brain it gives rise to fever and aches and, by depressing the brain, may affect all internal organs. Furthermore, the small bacteria themselves may be absorbed either through the capillaries or lymphatics and reach the general circulation. In this case they are apt to form other focuses of disease in different parts of the body.

Saprophytic bacteria, on the other hand, do not cause disease because they are capable of development only in and from dead animal and

vegetable matter. They cannot develop in living tissues because of the presence of oxygen in the blood. "Saprophytes" is a general name applied to all bacteria whose function it is to reduce all dead organic matter to soil.

But while I say that this class of bacteria cannot cause disease it must be added that if taken in in partially decomposed food, or if growing with abnormal rapidity in sluggish bowels from ordinary food, they can cause a more or less serious sickness technically called "auto-intoxication." These germs produce a toxin, which, though less virulent, is more abundant, than that produced by disease-germs ,and, when absorbed, causes quite a serious sickness manifested by fever and headache. The alkaloids developing from tainted meat, and usually called "ptomaines," are a toxin or saprophytic product, and "ptomaine poisoning" means intestinal absorption of ptomaines.

VARIOUS SPECIES OF BACTERIA.

Magnified 1,200 Times.

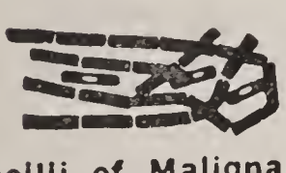
Bacilli of Pneumonia

Bacilli of Septicemia

Micrococeus Prodigiosus
(Decomposing all food-stuffs)

Bacilli of Hog Cholera

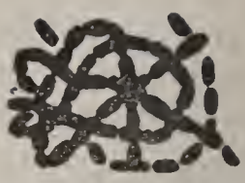
Bacilli of Influenza
(Grip)



Bacilli of Malignant Œdema

Bacilli of Lepra

Bacilli Cadaveris
(Decomposing the cadavers)

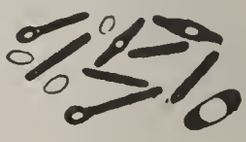


Bacilli Cadaveris
(Decomposing the cadavers)

Bacilli of Erysipelas

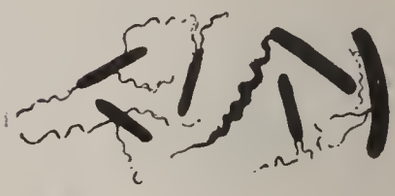
Bacilli of Anthrax
(Spore forming)

Bacilli of Diphtheria



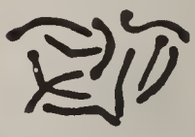
Bacilli of Sympto. matic Anthrax

Bacilli of Tuberculosis

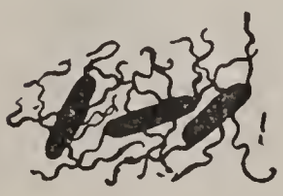


Bacilli of Sympto-matic Anthrax
(Flagellated form)

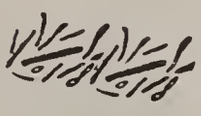
Bacilli of Typhoid Fever



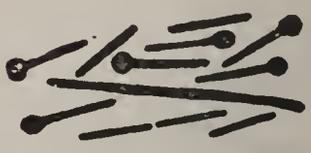
Bacilli of Syphilis



Bacilli of Typhoid Fever
(Flagellated form)



Bacilli Pyocyaneus
(Pus forming organisms)



Bacilli of Tetanus
(Lockjaw)

The growth of saprophytic bacteria is inhibited (checked) by cold, whereas that of the pathogenic germs is not; disease germs thrive in winter as well as in summer. Both kinds thrive equally well at the normal temperature of the body, and the growth of both is inhibited by a temperature higher than normal heat. A temperature of 105 degrees F. kills them in a few hours; 104 degrees in from twenty-four to forty-eight hours, and 102 or 103 degrees in from seven to nine days. The fever is not caused directly by the disease or the germs, as the people generally believe, but is a reaction of nature, the weapon of nature, in fact, to fight the disease or kill the germs, and the more virulent the toxin of the disease the greater the reaction, hence higher the fever. For instance in scarlet fever the high temperature of the second and third days kills the germs outright and the disease subsides on the fourth or fifth day. In typhoid fever the bacilli are killed on the 7th, 8th or 9th day, but the body is so saturated with the toxin of the disease that the fever and stupor of the patient persist yet for several days. In tuberculosis the tubercle bacilli are not killed by the fever because the temperature rarely rises above one hundred degrees.

The moulds that grow on the skin some time after death are a species of saprophytic bacteria. The yeasts are also a special order of bacterial cells, which when mixed with farinaceous pastes, grape juice or malt, produce gas, which process is known as fermentation of the juice, brew or paste. When the paste is placed in the oven the yeasts, under the first influence of heat, throw out a large quantity of gas, causing the paste to swell up, which process is known as "leavening of bread." The subsequent stronger heat kills these bacteria just in time to prevent an extreme ballooning of the bread.

Certain classes of saprophytes are very useful and play a great part in human life, and might be called "domestic bacteria." Many phenomena occurring in daily life and not realized by the people are really the work of these bacteria. For instance, buttermilk and sour milk are the result of fermentation induced by the bacillus Lacticus, which is always present

in the air. Vinegar is the result of fermentation induced by the bacillus Aceti, also always present in the air. Alcohol in wine or cider is the result of fermentation induced by the yeasts in the sugar of the juice. So is the leavening of the bread, as already stated. The appetizing taste and odor of cheeses are the result of fermentation induced by various bacteria. Strictly speaking, all the odors arising from these various substances are gases produced by bacteria. Rancidity is also a fermentation induced by zymogenic bacteria.

The saprophytes, whose task it is to reduce all dead matter into its original elements, are everywhere,—in the air, water, soil, and on or in the food we take. And there is such a power of growth in them that every moist article of food exposed and all dead organic matter become their prey. Only the combination of certain chemicals can prevent their action. Millions are in every mouth, which decompose the particles of food lodged between the teeth, giving rise to odor. Those that are swallowed with the food are digested and undergo the fate of the food. An idea can be gained of the rapid and effective work of these bacteria from the fact that in less than twelve hours they totally decompose and liquefy the shreds of meat lodged between the teeth.

BACTERIA AND DISINFECTANTS.

A Lesson in Chemistry.

The bacteria most interesting to undertakers are the bacilli of cadaveric decomposition and those of intestinal putrefaction, namely:

Bacilli of Flesh Decomposition.

1. Bacillus Albus Cadaveris (White bacillus of cadavers). Decomposes the blood of cadavers and produces gas.
2. Bacillus Citreus Cadaveris (Yellow bacillus of cadavers). Decomposes the flesh and produces tissue gas.
3. Bacillus Saprogenic. Causes general putrefaction and produces tissue gas.
4. Bacillus Mirabilis. Causes general putrefaction and produces tissue gas.

Bacilli of Intestinal Putrefaction.

Bacillus Coli Communis (Colon-Bacillus) produces fermentation, putrefaction and gas.

Bientock's Bacillus Putrificus, causes putrefaction and gas. (These are the two bacilli which produce the intestinal gas. Their special task is to decompose all food-stuffs that the intestines do not absorb. The intestinal gas is a by-product of this decomposition.)

The degree of resistance offered by bacteria to the action of disinfectants varies according to the species of the germs and the chemical components of the disinfectant. Certain species of bacteria are killed by a particular chemical compound and not by others. Again, different bacteria require disinfectants of different strengths to be destroyed.

A common error of insufficiently experienced chemists is to combine several strong chemicals for the purpose of producing a disinfectant of high power. Many undertakers themselves are attempting the same thing, unaware that all strong chemicals, when mixed together, either neutralize, decompose or counteract each other. Chemicals are either com-

patible or incompatible with each other. When incompatible they cannot combine in any way, and, if mixed, they will form a useless or dangerous mixture. If compatible they still have to be mixed in certain given proportions to permit of chemical union. Chemical union means "forming a definite compound," in which the elements are chemically bound together. For instance, water is a definite compound, consisting of two parts of hydrogen and one part of oxygen by weight; in chemical terms, "two atoms of the former and one atom of the latter." Hydrogen and oxygen are two gases, but when chemically combined they form water. But while two atoms of hydrogen combine so well with one atom of oxygen, three atoms of the former connot combine with either one or two atoms of the latter, chemical union between them being impossible. On the other hand, two atoms of hydrogen combine well with two atoms of oxygen, though the resulting compound is not water, but the well known peroxide of hydrogen, which is also a definite compound. Again, if another chemical be mixed with peroxide of hydrogen, this compound will be chemically broken and its antiseptic action destroyed or modified. If a new chemical union takes place in the mixture we will have an entirely different compound with an entirely different action, which may be inert or poisonous. The same is true of every disinfectant.

As an instance of absolute chemical incompatibility I should mention formaldehyde and peroxide of hydrogen. When these two chemicals are mixed in any quantity the peroxide of hydrogen is decomposed into water and free oxygen, that is to say, one of the two atoms of oxygen is liberated and reassumes its gas form. What is the result? If the mixture be placed in a bottle sealed air-tight, this gas accumulates therein until its pressure causes the bottle to explode, and this explosion takes place in from six to forty-eight hours. If, however, either the formaldehyde or peroxide of hydrogen is greatly diluted the generation of oxygen gas may not be sufficient to cause an explosion, but if injected arterially or in the

abdomen it is liable to give rise to swelling. Any one can make this test by mixing pure formaldehyde with pure peroxide of hydrogen, filling a small bottle with about half of each, and sealing it. The fuller the bottle the sooner the explosion takes place. This liberation of oxygen is made still more active by the presence of alcohol in the embalming fluid.

Nothing can show greater ignorance of chemistry than the mixing of bichloride of mercury with formaldehyde. The two are absolutely incompatible, and the action of the former is entirely nullified by the latter. Moreover, the bi-chloride of mercury is thrown out of solution shortly after.

Formaldehyde is a very good disinfectant, but, for embalming purposes, it should always be used only as an adjunct, never alone; its action must be modified and mollified by other chemicals combined with it. If used alone it gives a repulsive appearance to the face, interferes with the removal of the discolorations, and, owing to the rigidity it produces, it cannot pervade, hence disinfect, the whole flesh. Furthermore, as formaldehyde cannot and should not be used of a greater strength than 4 to 8 per cent., it cannot destroy certain kinds of bacteria. The destruction of many has to be accomplished by other chemicals combined with the formaldehyde.

All bacteria and disease germs are killed by a disinfectant or embalming fluid containing in combination the proper chemicals in compatible strength, provided enough of the fluid be injected to reach them all.

AUTOPSY CASES.

In "posted" bodies in which only the stomach and bowels have been removed without injuring the Abdominal Aorta an arterial injection can be made as usual after ligating the three branches of the Aorta which supply the stomach and bowels. These are the Celiac Axis, and both the Superior and Inferior Mesenteric Arteries. When, however, the circulatory system has been broken by the removal of the heart the task of the embalmer is twice as great and preservation more liable to be imperfect. In such a case, to insure preservation, one has to inject the limbs and head individually and pack the cavities. The task is long and tedious, and many embalmers are liable to neglect part of it for want of time.

This is where our "Glacial" fluid plays a great part by its osmotic penetrating properties. It insures preservation without arterial injection for a space of time far beyond the funeral day, if used as follows:

Inject a whole bottle pure in the abdomen. If the bowels have been removed put in some cotton packing to retain the fluid therein. Then take another bottle of Glacial, pour about a tablespoonful of it into the mouth, then pour some in a cup and with it bathe the skin of the whole body except the face. Finally inject the balance of the bottle into the chest cavity. If the face is to be given a good complexion inject from half to a pint of a regular arterial fluid through the Carotids upward. If not, the face can also be bathed with Glacial, diluted one half.

"All "posted" bodies embalmed in this way have kept invariably well. If, however, such bodies are to be shipped to quite a distance it is advisable to inject the limbs individually, either arterially or beneath the skin by means of a small bulb syringe.

HELPFUL SUGGESTIONS

Which Should Be Learned By Heart.

To embalm a body judiciously and properly always take into consideration:

1. The cause of death.
2. The condition in which the body is.
3. The season.
4. The length of time the body is to be kept before burial.

Remember that a formaldehyde fluid used hot causes much more rigidity than if used cold.

When you cannot get a circulation always examine your tube before thinking the cause may be in the arteries.

If you want the fluid to do its work use it right and in sufficient quantity.

To produce a uniform appearance on the face the fluid has to be evenly distributed, and only a sufficient quantity can produce an even distribution. When only two quarts are injected the circulatory system is not half full, and in the next 24 hours the fine complexion of the face has often faded away because the fluid from the face has gravitated away to parts devoid of it.

Remember that the embalmer who, as a routine, injects three or four quarts of fluid in the arteries and one bottle of concentrated undiluted fluid in the abdominal cavity, will never have a single failure, and his invariable success will make his reputation.

Remember that the massaging, to best remove the discolorations from blood stagnating in the capillaries, should be done before and while injecting the first two quarts. After that it is too late.

Remember that the most common cause of the face turning black, either before or after embalming, is gas formation in the veins, which drives the blood back into the skin. You can always prevent that by injecting enough fluid to reach the veins and disinfect the blood therein.

Remember that when the bowels are greatly distended by gas, as evidenced by bloating, their capillaries are closed to the arterial injection, and that in such a case the abdomen can only be disinfected by a cavity injection.

Remember that if you want three quarts of fluid in the tissues you have to inject four quarts, and if you want two quarts in the tissues you have to inject three quarts, because the last quart does not reach the capillaries, but remains in the arteries and heart, from where it exerts no disinfecting action on the flesh.

REGULAR PROCEDURE FOR A THOROUGH EMBALMING.

1. Wash the body if need be.

2. Sponge the body with fluid diluted as for arterial injection. Remember that the body of a woman, especially in summer, is liable to smell from the vagina. Give attention to this part. The arterial injection will not kill this odor because it arises from the secretions of the vagina.

3. Shave, if necessary.

4. Bathe the face with glycerine and water equal parts, or any massage preparation.

5. Inject from one to four ounces of fluid into the mouth or through the nose to disinfect the mouth, throat, trachea and bronchi. In bad cases use our "Glacial" fluid pure.

6. Set the chin-rest or stitch the jaw.

7. Close the eyes properly.

8. Get ready for your injection; be sure that your arterial tube is not clogged up, and do not forget to expel the air from your rubber tube before connecting it with your arterial tube.

9. Drain the blood in all cases of full-bloodedness, obstructed circulation, dropsy, and early fluid-purging.

10. Rub the lips with "Balmrose" to prevent their turning black and keep them soft.

11. If there are any blood discolorations in the face or ears try to massage them away with cold water and glycerine equal parts, or any massage preparation, while you inject your first two quarts. If you do not succeed, try with hot water. You will learn by experience that some of these discolorations are better removed with cold applications and others with hot water.

12. If you use our colored fluids remember that the rosy tint should appear on the face after injecting three pints. If it does not you should add about one-third of a tubeful of Coloring to the fourth pint, and also add some Coloring to the second half gallon.

13. Give due attention to the abdomen; if much gas is there let it out or aspirate it, and inject some concentrated undiluted fluid.

14. To keep the skin soft and retain the fine complexion given to the face, the immediate step after the arterial injection is to rub the face and ears with Balmrose. This prevents excessive hardening of the skin, favors an even distribution of the fluid, and leaves a pleasant odor.

15. For abnormal cases, such as jaundice, dropsy, tissue gas formation, etc., see their respective chapters through the index.

A Strong Reason Why a Minimum of Three Quarts Should Be Injected Arterially.

When only two quarts are injected the circulatory system is hardly filled to one-third of its capacity. The skin of the face and neck, however, get a good supply of fluid from the first two quarts. But, as many parts of the body are devoid of fluid when only two quarts have been injected, the fluid from the face gravitates away to the parts devoid of it, or into the nearest veins, if these are partially empty. Hence, the beautiful complexion that our Coloring gives may partly disappear in the next twelve hours as the fluid withdraws from the face.

Therefore to produce and retain the most beautiful complexion three quarts must be injected arterially in small bodies, and four quarts in larger bodies.

Furthermore, the rosy tint produced by our fluid is not usually as uniform from two quarts as from a larger quantity. If pink streaks appear on the face after injecting only two quarts the embalmer should only blame himself.

DISEASES OF THE VEINS.

1. Phlebitis,—inflammation.

2. Varix or varicose veins. This is an enlarged, elongated, tortuous, knotty condition of the Long Saphenous Vein and its branches. It always begins and is most marked in the legs below the knee, but often extends to the thighs. Very rarely do other veins become affected in this way. The immediate cause of this condition is the absence or destruction by disease of the valves of the vein. The function of these valves is to support the upward flow of the column of venous blood. When absent the entire weight of the column of blood falls upon the walls of the vein, causing their dilatation and elongation, often resulting in breaking out, which is then called a varicose ulcer.

THE THREE DEGENERATIONS OF THE ARTERIES.

1. Sclerosis (loss of elasticity of the arteries, resulting in hardening of their walls). Begins in middle life and is most marked in old age.

2. Atheroma--chronic inflammation of the inner coat of the arteries, resulting in fatty degeneration. Occurs in adult life, most commonly from such diseases as alcoholism, syphilis, gout, rheumatism and Bright's disease.

3. Calcification (lime salts depositing and crystallizing in the walls of the arteries). This is in fact, an aggravation and later stage of Atheroma, in which the cheesy masses calcify. Occurs in later life.

LOCAL DISEASES OF THE ARTERIES.

1. Arteritis (inflammation).

2. Thrombosis (blood-clot forming at an obstructed point).

3. Embolus (a mobile blood-clot).

4. Aneurism (great local dilatation of an artery).

WHAT NECESSITY IS THERE TO INJECT THE BRAIN?

There seems to be a misconception among embalmers, which, I suppose, originated from misunderstood teaching. I found that, when a free circulation cannot be obtained, many embalmers endeavor by strenuous means to inject fluid into the brain besides injecting the other cavities. Is it necessary to inject the brain in such a case? This is quite an important question, and I am going to solve it in my own way with arguments supported by evidence.

I say it is totally unnecessary to inject the brain in such a case unless you want to keep the body much longer than the usual time. It is rather hard to get there with the trocar and it does no good. Why? Because the bacteria can never invade the brain tissue rapidly enough to give rise to odor in ten days in summer and twenty days in winter.

The brain, it must be remembered, is the part of the body least exposed to the invasion of bacteria. All parts of the body except the brain can be rapidly invaded by continuity, but the brain is inclosed in a tight box and can only be invaded by continuity through small openings technically called "foramina." The largest opening is the Foramen Magnum, which gives passage to the origin of the spinal cord, known as Medulla Oblongata.

The process of decomposition begins as follows: First in the abdomen, then in the lungs, thirdly in the blood, and fourth in the skin.

Bacteria can invade the brain only through the small openings already mentioned or through the blood, and, after death, the brain tissue is devoid of blood. At death the blood collects in the sinuses of the skull, which sinuses are in fact the veins of the brain. But these sinuses are not in the brain proper. They are between the skull and the brain, and it is therefore from the periphery that the bacteria have to invade the brain tissue. The brain

tissue has the smallest supply of blood of the whole body, and stands in contrast with the thyroid gland which has the greatest supply.

If bacteria are present in the blood at the time of death some will be present in the sinuses of the skull, where the blood is collected, but these sinuses are in the periphery of the brain. For these various reasons you will find as a foregone conclusion that both the invasion and proliferation of bacteria in the brain tissue, either by continuity through the openings of the skull or by way of the blood, can only be very slow.

Of course you may say that the blood in the sinuses may decompose and give rise to odor. To this I will answer that decomposition in a tight box is a great deal slower than in the soft parts which can undergo free expansion from accumulation of gas.

WHAT QUANTITY OF FLUID IS REQUIRED TO PRESERVE A BODY OF AVERAGE SIZE.

In my relations with the undertakers I found a vast diversity of opinions and practices in that regard, some injecting as much as seven quarts in summer and six quarts in winter, while others would confine themselves to two quarts in every season. In order to determine accurately and judiciously the amount of fluid required to disinfect a body we must know what parts of the body, or rather which capillaries of the body are reached by each quart successively. In this connection we must remember that only the fluid present in the capillaries can preserve the flesh. The fluid which remains in the arteries and heart only preserves the arteries and heart.

After making this remark I will give you the results of experiments made with my colored fluid to show what parts of the body are reached by various quantities of fluid. In these experiments I found that when injecting the Axillary or Brachial artery the first pint reaches no capillaries. That the second pint in many cases begins to show its color on the face and ears, and sometimes in the left hand. That the second quart goes entirely into the face, neck, left arm and internal organs. I

found that after injecting these first two quarts the face and neck had their full supply of fluid; that the left arm and shoulders were filled to about half their capacity, the internal organs to about one-third their capacity, and that the capillaries of the lower limbs, right arm and central parts of the brain were entirely devoid of fluid. I found that after injecting three quarts the capillaries of the lower limbs and brain were partially but very imperfectly reached by the fluid. After injecting four quarts some fluid, however, was perceptible in the muscles of the calves of the legs and most parts of the brain. It goes without saying that the right arm is never sufficiently disinfected without injecting downward.

These results tend to show that four quarts of fluid are necessary to obtain a fair degree of preservation in a body of average size, and, if the blood has been drawn out, these four quarts will not even fill the body to one-half its capacity, because the veins alone can hold four quarts.

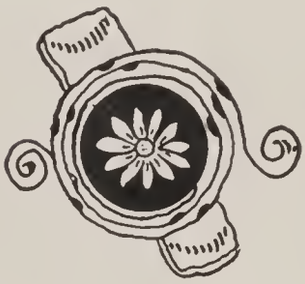
These experiments were made possible and plain only by using a highly colored fluid, in which I added three times the normal proportion of the coloring I manufacture.

To conclude on this subject I must repeat here what I have said to so many embalmers: You cannot preserve a body of average size with two quarts of fluid in the arteries, for the obvious reason that only the fluid which permeates the capillaries can preserve the flesh. When you inject only two quarts you get only one quart in the capillaries because the last quart injected always remains in the arteries and heart, from where it has no preserving action on the flesh.

I wish to also impress upon you the necessity of injecting more fluid in bodies dead of septic or infectious diseases than in those dead from accident, old age, or tuberculosis. Why? Because in such cases the production of gas is much greater and more rapid. Typhoid and scarlet fevers, peritonitis,

puerperal fever of childbirth, and diphtheria are the most common infectious diseases. In all such cases the abdomen should be treated with concentrated undiluted fluid, injecting therein one or two bottle of it.

All embalming schools and all authorities, professors and writers on embalming say and repeat time and again: "You cannot keep a body with two quarts of fluid." Still, there are embalmers who persist in only using two quarts as a rule. I say you can keep "certain" bodies with two quarts in winter, but it is not safe to try it, unless you are well experienced in determining the conditions present in such bodies. At any rate this cannot be called perfect embalming.



HOW TO DETERMINE AND LOCATE THE PRESENCE OF GAS IN THE ABDOMEN.

In my relations with the embalmers I found that many of them could not make out the presence or absence of gas in the abdomen. Or, when gas was present, they could not locate it. When I say the presence or absence of gas, please do not misunderstand me. I mean the presence or absence of considerable gas, because in either living or dead body there is no abdomen without gas. In the body of an adult, even when the abdomen is sunken in, there is from two to four quarts of gas.

I have heard many embalmers say: "There is no gas in this body," when in fact there were six or seven quarts in it. After embalming, when the fluid has made the abdominal muscles rigid, the abdomen always sounds like a drum under percussion, which invariably indicates the presence of gas.

I also found that when the abdomen was swollen up many embalmers could not determine whether the swelling was due to the presence of gas or water, or to a certain proportion of each.

I noticed that some would try to make it out by palpation, that is by striking the abdomen with the palm of the hand or fingers. I should say this is a wrong and very deceptive procedure.

The only way to determine and locate the presence and quantity of gas is by percussion, that is to say, by placing the middle finger of the left hand on the various parts of the abdomen and striking upon it with the fingers of the right hand. This will produce a hollow sound, almost like the sound of a drum, wherever there is gas. This sound can only be produced by knocking upon a hard body like the finger, and never by knocking on the soft wall of the abdomen. The presence of gas is still more noticeable after embalming, because the abdominal wall is then rigid and tense.

The next question is this: "In what parts of the abdomen are we likely to find gas?" I should answer most emphatically that you will always find it along the course of the Colon. Naturally, when gas is present in large quantity, such as in septic

cases, you will find it all over, in the small intestine as well as in the Colon.

The Colon in fact circles the abdomen. It has three subdivisions, namely, the Ascending Colon, the Tranverse Colon and the Descending Colon. At the beginning of the Ascending Colon is a large pouch known as the Cecum. This pouch, which is just above the groin, is always more or less filled with gas. I might add, in the way of fun, that the tail-end of the Cecum is better known than the Cecum itself. In fact, it is known to everybody, to the non-professional as well as the professional, and known all over the world. I mean the famous vermiform appendix. But please don't look for gas in the appendix.

The central and left parts of the Transverse Colon and the lower end of the Descending Colon are always more or less filled with gas.

I suppose you all realize how important it is to know how to make out the presence of gas and its location in order that you may direct your trocar to the right spot to aspirate it.

When the abdomen appears to be full, and percussion upon it produces a dull sound instead of a hollow sound like a drum, it means you are striking upon water or fat. If it is a lean body you can be sure the fullness is due to the presence of water, but if it is a fat body it can only be ascribed to the fat.

The next thing would be how to differentiate between water and a tumor when the abdomen appears rather full and produces a dull sound under percussion, but this would be going into the question too deeply, as you are not expected to diagnose a case as well as a doctor.

WHAT AMOUNT OF PRESERVATION CAN BE OBTAINED FROM APPLYING A FLUID ON THE SKIN?

To realize the amount of preservation you can obtain in this way you have to remember that there is no absorption beyond the skin where there is no blood circulation. The skin of the living body absorbs readily and the blood which circulates through it takes up and carries along whatever the skin absorbs. Thus all non-astringent liquids and oils are easily absorbed by the skin when applied with friction. Water and glycerine are the substances most rapidly absorbed when rubbed on.

But in the dead body you can only disinfect the skin by external application or rubbing, because there is no blood circulation and the skin is cold. Cold contracts the skin and thereby interferes with absorption. Heat produces the opposite effect and favors absorption, but only in the living body.

THE EFFECT OF DRY AIR ON TISSUE PERMEATED WITH A FORMALDEHYDE FLUID.

I have repeatedly observed that in dry weather a formaldehyde fluid has an unusually hardening effect on the skin of the face. This hardening effect is much less marked in rainy weather. Any close observer will notice the same phenomenon. For a time I could not account for that, and had to study the subject very carefully. Finally I came to the conclusion that a damp atmosphere relaxes the skin, permitting the pores to remain more or less open, and in fact producing a moist skin. It is this relaxation and moisture which counteract the effect of formaldehyde, the moisture itself diluting the fluid in the superficial capillaries. This hardening effect does not occur when the first fluid injected contains but little formaldehyde.

I found, however, that it was an easy matter to counteract the action of formaldehye in any kind of weather. A mixture of glycerin and water, half and half, applied or rubbed on the face either before or during the injection of the first two quarts, will suffice to prevent the hardening of the skin.

ABOUT DROPSICAL CASES.

In the case of dropsy the waters of the body, if not thoroughly drawn out, not only weaken the embalming fluid, but also stand as an obstacle to its circulation. In order to obviate this great disadvantage the waters have to be drawn out as well as possible. This can be done in three different ways. Firstly, by draining out the blood, because as you drain out the blood you also drain out some water. Secondly, by aspiration in the parts which contain an accumulation of water. Thirdly, by pricking the skin all over the swollen parts, and then using compression by means of gauze bandages tightly applied. Gauze bandages will at the same time squeeze out the water and permit the escape of it.

In addition to that plenty of fluid should be injected in the arteries, and at least one bottle of concentrated undiluted fluid in the abdomen.

To draw the water from the skin the Baunscheidt instrument is by far the best pricking machine. With it one can prick the whole body in a very short time as it has from 20 to 30 needles. It can be bought for a few dollars at many dealers in surgical instruments. That instrument is manufactured to produce counter-irritation on sick patients, but it answers the purpose of a pricking machine admirably.

A FEW DISCOVERIES MADE BY MEANS OF OUR COLORING.

The coloring in our fluid has been the means of making various interesting discoveries, of which I will make a brief mention.

1. I discovered that the abdomen cannot be disinfected by arterial injection when it is greatly bloated. Why? Because, as I stated elsewhere, the walls of a distended bowel cannot admit the fluid, their capillaries being greatly narrowed or obliterated by the stretching. The results from the stretching of the bowels are exactly the same as those from the stretching of a rubber tube. The more you stretch the more narrowed is the lumen. I repeated the experiment several times with a bowel inflated to distension. Every time I could see the colored fluid circulating through the small arterial branches, but I observed that none at all could penetrate the capillaries, where disinfection is to be accomplished.

2. I discovered that the tissues nearest the point of injection absorb much more of the fluid than those of more distant parts. For instance, if you inject the Axillary or Brachial artery, the upper part of the body, especially the face, absorbs more of the fluid than if you inject the Femoral. By injecting the Femoral most of the fluid is absorbed by the internal organs, and less of it gets to the face. This fact is made very plain by the colored fluid. When we inject the Axillary or Brachial the face gets a full supply of fluid as shown by the pink color appearing there. But if we inject the same amount of fluid by the Femoral with the same degree of color the face becomes much less pinkish. To obtain the same degree of color in the face by injecting the Femoral you have to inject about a quart more of colored fluid. This means exactly that in order to get as much fluid in the face from the Femoral as from the Axillary, you have to inject a quart more.

The Seven Advantages Derived From Using In the First Injection a Strong Preservative Causing But Little Rigidity, Such as Paraform.

1.—The discolorations are better removed.

2.—It enables the veins to retain the blood within their walls.

3.—The face and neck become less puffy.

4.—The flesh is better penetrated and saturated, and therefore better preserved.

5.—A dry atmosphere produces less of a hardening effect on the skin of the face.

6.—You can produce a better color in the left hand because it allows you to leave the left arm down during the first injection.

7.—I know by experience that when the Axillary or Brachial is used the right shoulder gets its full supply of fluid from the first injection. Hence, when a strong formaldehyde fluid is used in the first injection this shoulder becomes quite rigid, so that after the embalming is done you have to break that rigidity to bring the arm back alongside of the body. But if in the first injection you use a fluid which causes much less rigidity, you will not encounter this difficulty.

Preservation of the Egyptian Mummies Explained.

A MYSTERY OF THOUSANDS OF YEARS SOLVED.

BY DR. G. H. MICHEL, M. D., R. SC.,

In these past years I have made a thorough study of bacterial decomposition, that is to say, of the bacteria whose function it is to reduce to soil what arose from the soil, which includes all organic matter, animal and vegetable. In the course of these studies and experiments I found that what had been regarded as a wonder for so long was in fact a simple thing, that almost anyone can perform. My findings enable me to assert most emphatically that the Egyptian mummies were not preserved by antiseptics or disinfectants, or by anything related in any way to the present methods of embalming. My conclusions will be found self-evident after reading the following which contains the fundamental proof.

In the preservation of the Egyptian mummies two things have to be explained, namely: The prevention of bacterial decomposition and the prevention of disintegration from the wear and tear of thousands of years. These two things are here satisfactorily explained.

It is admitted that the Egyptian process consisted of removing the internal organs and packing the cavities with clay or other substances. The most authentic thing known, however, is that the bodies were tightly bandaged.

The Mummies Were Not Embalmed at All.

My conclusions are founded, not only upon what I discovered, but also upon the exclusion of all means of embalming which could not have been known to the Egyptians of olden time. From my findings the fact burts out that the mummies were not embalmed at all. How they were preserved will be seen further.

To-day a body can be preserved after death by thorough antisepsis, that is, its flesh must be saturated with an embalming fluid as it is saturated with blood during life, and the fluid must be strong enough to prevent bacterial growth. The fluid is made to circulate through the flesh by way of the arteries, just as the blood does in life, but the circulation of the blood and the circulatory system, which includes the arteries, capillaries and veins, were unknown to the Egyptians, this discovery being only a few centuries old. Therefore this procedure could not have been used at that time. Antisepsis and bacteriology were also entirely unknown to the Egyptians, these being still more recent discoveries. Furthermore, bacteria or germ-life can only be revealed by the most powerful microscopes, which also are of recent origin. Again whatever things they could have inclosed in the cavities after removing the internal organs could never have preserved the limbs.

Hence, internal embalming by means of disinfectants must be excluded from the Egyptian process of mummifying. On the other hand, external embalming by means of disinfectants applied to the surfaces of the body could neither have prevented decomposition in the muscles, because where there is no blood circulating there is no absorption beyond the skin. After thus showing that the Egyptians could not have protected the bodies from bacterial decomposition by means of internal flesh disinfection because the circulation of the blood had not been discovered, we now come to the last point, the only thing left to argument and the only way in which they could have mummified the bodies. I tested this very thing and there I found the truth. Here are my discoveries:

The breaking down of the body is produced by bacterial growth, which is extremely rapid. The growth is attended by two by-products, toxin and gas. The bacteria grow in and from the flesh as a natural process, they being a part of nature. Bacterial growth takes place as follows: Each bacterium (singular of bacteria) develops from another bacterium. It is fully formed in less than a minute, and in less than another minute it itself gives rise to a fellow by segmentation. This proliferation by segmentation from the same bacterium is repeated from 60 to 90 times an hour as long as there is food for development. When the food is exhausted the bacteria die. Thus in 24 hours each bacterium, by successive crops, produces many thousands, and the general proliferation continues until all the soft parts of the body have been absorbed into bacterial growth.

This absorption of the body by bacterial growth is, strictly speaking, a necessary transmutation. I say a necessary transmutation because the flesh in its organized state cannot be assimilated by the soil, but the bacteria themselves, as soon as dead, are suitable for soil assimilation and readily assimilated. Hence, the body has to undergo bacterial transmutation, i.e., be turned into a mass of bacteria, in order to be suitable for soil assimilation, and thus reach its ultimate state, or rather, revert to its original state.

The dead body undergoes three successive stages of transition, namely: Expansion, shrinking and disintegration.

Expansion is due to gas formation in all tissues. The body swells up in the first stage because the gas does not find its way of escape. Shrinking begins when the gas finds its way out of the body freely through the pores, appearing on the skin in the form of scum. Disintegration of the flesh follows, and when it is complete the last of the bacteria, which have done the work, themselves die in the last remnants of the body.

My experiments showed that when, in the first stage, expansion and the escape of the gas are prevented the bacteria can no longer proliferate and they die, killed in fact by their own products—toxin and gas. This is just what resulted from the Egyptian process of mummifying. Hence, the whole secret of the mummies lies in the way they were swaddled. It is well known they were tightly bandaged, but ordinary dry bandages, not being air-

tight, could not have prevented the escape of gas and the gradual evaporation of the fluids which make up about 85 per cent. of the body. Moreover dry bandages would have fallen to pieces in a few centuries, for no cloth can stand the wear and tear of thousands of years. But the bandages they used were immersed in a gluing substance which, when dry, produced a tightly-fitting swaddle of iron strength and air-tight, invulnerable to time and unbreakable from the internal gas-pressure. Silicate of soda (water glass), plaster of paris or ordinary carpenters glue would answer this very purpose. Hence, expansion, the escape of gas and evaporation being prevented, no decomposition could ever have taken place, and no part of that iron-bound body could ever have gotten lost. That is why such bodies remained intact, mummified.

As bacteria, which, alone, can break down a body in the natural way, had not been revealed to the Egyptians by the microscope, their original purpose in thus swaddling the bodies could only have been to retain their form intact and prevent the rise of odor. The prevention of decomposition was an incidental result.

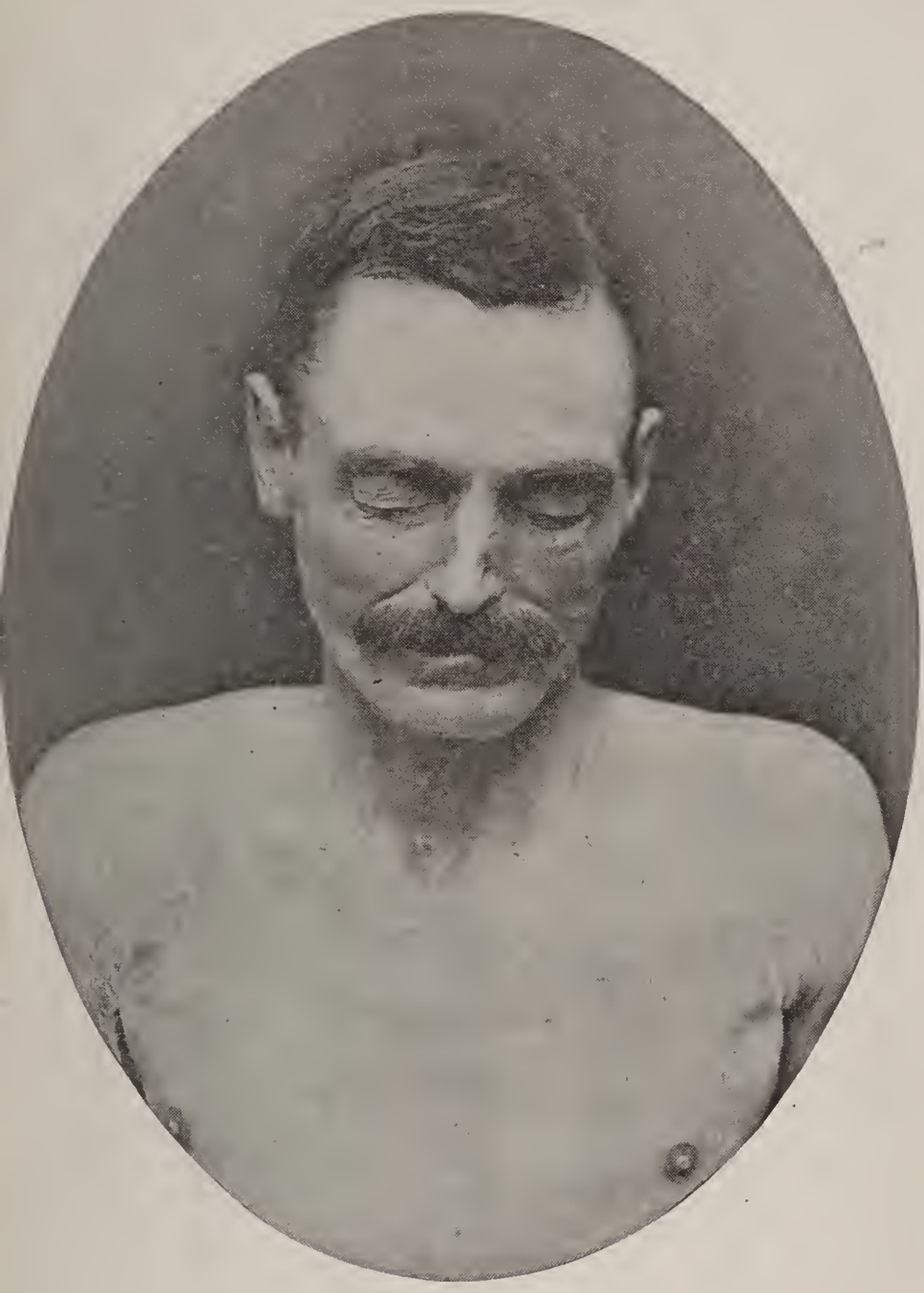
Anyone wishing to mummify a body in the same way as the Egyptians used to do can do so to-day by wrapping it up tightly and thoroughly with bandages impregnated with silicate of soda. The features of the face can be retained by applying thereon several coats of silicate without bandages. But, of course, such bodies have nothing life-like.

The writer has succeeded in producing a coloring which gives a strikingly life-like color to the face of the dead when mixed with any embalming fluid, and is the first thing found that removes the yellowness of jaundice. This coloring does not exist in nature, it is a chemical color, so strong that in its concentrated form, it penetrates even porcelain. It is diluted over a hundred times when made ready for use.

OUR OLD MUMMY.

One Year Old This February, 1913.

Embalmed February, 1912, with Paraform and Ozoform in the arteries, and one bottle of Glacial in the abdomen. Though left at all times exposed in a warm room, this body is to this date, February, 1913, in a perfect state of preservation, and no odor ever arose from it. It has slowly dried up but remains in full form as seen in this picture. (On exhibition at John I. Nunn's undertaking establishment, 2347 East 55th Street, Cleveland, O.)

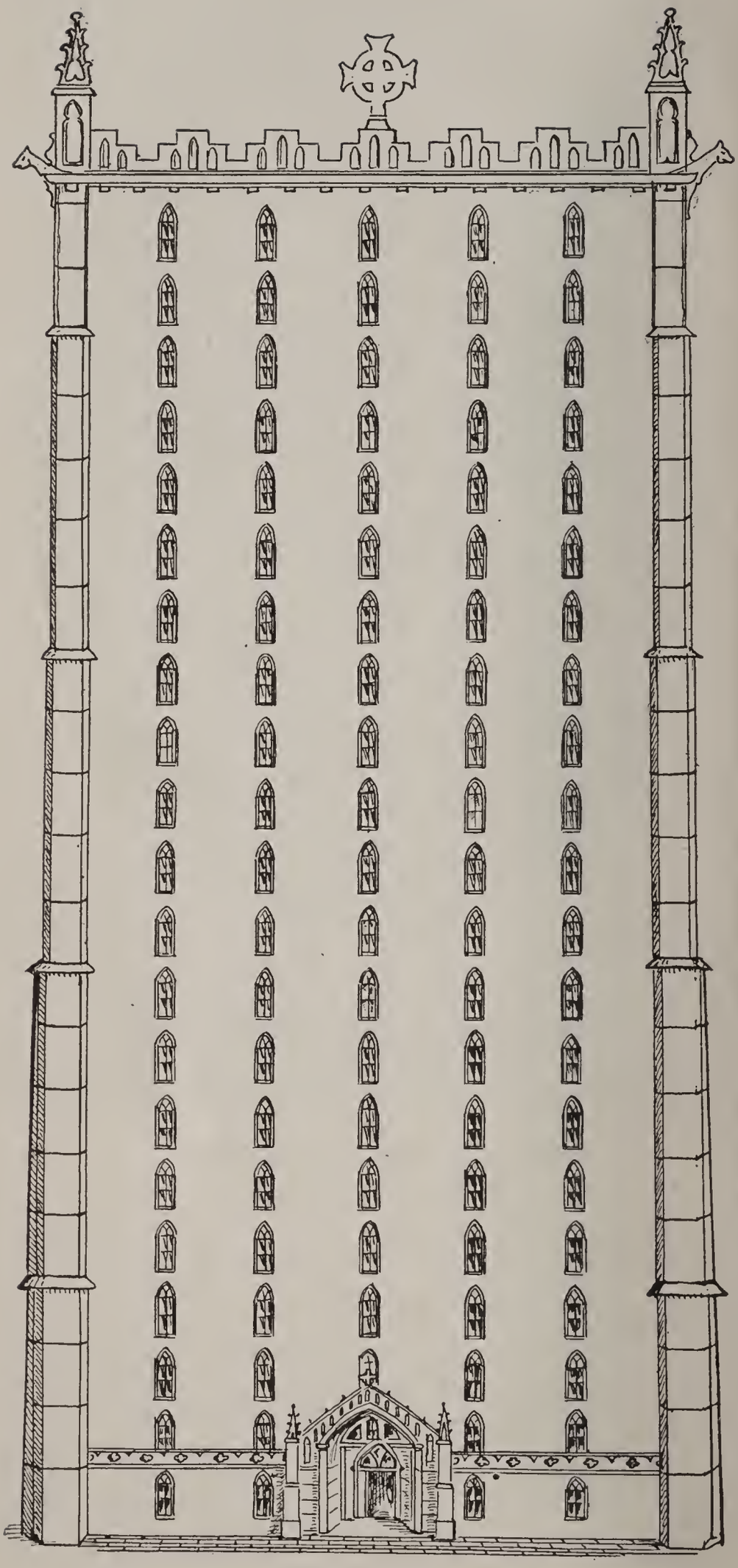


OUR YOUNG MUMMY.

Three Months Old This 15th of February, 1913.

Body of Thomas Woodrow.

Embalmed November 16th, 1912, with Paraform and Ozoform in the arteries and one bottle of Glacial in the abdomen. To this date, February, 1913, this body is in a perfect state of preservation and lifelike. No change whatever has taken place in it. This one is to be a test not only for preservation, but also as to the length of time that we can keep a body life-like. With this object in view this body is being kept protected from the air. (On exhibition at same address as the preceding.)



A 21-STORY COMMUNITY MAUSOLEUM
Projected for New York City.
(See over.)

Upon the suggestion of a New York syndicate interested in the realization of such a project, Dr. G. H. Michel modified its plan from the pyramidal (his original idea) to the vertical form, to double its capacity. This palatial edifice, built upon a basis of one-fourth acre, will contain 54,000 bodies in individual crypts, that is, as many as a cemetery of forty-four acres, or 176 times more than the same space in a cemetery.

A mausoleum of this type will be of tremendous advantage in large cities, where the ground is so costly, and is in fact the present crying need of such cities as New York and Chicago.

Our method of embalming, together with the principles taught in "The Scientific Embalmer," insures perpetual preservation and lifelikeness for years, as proven by the two mummies shown in the preceding pages. This renders possible the construction of such skyscraper mausoleums as here illustrated, without necessitating the disinfecting plant in constant operation of the present small community mausoleums.

How does our friend, the undertaker, stand on this question of public mausoleums? The question is of national interest and we would be pleased to know the opinion of the majority. As the ground becomes more and more precious and is badly needed by the living, should not the cemeteries be made to extend skyward instead of landward, the space above being unlimited? The question involves a matter of economy, besides the satisfaction of giving the dead a dry resting place in a palatial monument.

Public mausoleums of this type were not to be thought of until the question of perpetual preservation had been solved. Now that it is solved let the question be considered judiciously by the public at large. An "Opinion"

is a peculiar thing which assumes a different complexion in different men. The men close to nature say: "What arose from the soil should return to the soil." The rude naturalist goes even further and says: "The return to soil should be quickened by cremation." We believe that is all true, but the sentimentalist does not agree with us. He is horrified by the idea of being cremated or cast into the ground to rot. In fact, we cannot tell the people what is best to be done, because the people has a will of its own and cannot be controlled; and we can no longer remain blind to the fact that the small community mausoleums so far built are well patronized, though being a costly form of burial. Unless cremation is to become general, every one will agree that the present rate of growth of our American cities will soon render imperative the building of such sky-scraper mausoleums.

OUR PRODUCTS

PARAFORM,

The Only Volatile Embalming Fluid.

Paraform, as we make it now, possesses the unique and peculiar property of disinfecting the tissues by volatilization; that is, two of its disinfecting principles volatilize by osmosis through the tissues and permeate them as perfumes permeate the air, though no odor is noticeable. Anyone can readily understand that this peculiar penetrating property will carry disinfection to the parts inaccessible to ordinary fluids, especially strong formaldehyde fluids.

In addition, Paraform, though being a powerful preservative, causes but little rigidity and flows in easily. It is to be used in the first half-gallon instead of the weak solution that many embalmers inject "to wash out the tissues," as they say, unaware that this weak solution, once in the tissues, cannot be driven out, that it is there to stay and that it will not preserve. Paraform washes out the capillaries as well as the weak solution does, and at the same time preserves thoroughly. It contains a small percentage of formaldehyde in a modified form.

Paraform is just the fluid for undertakers who want but a very moderate degree of rigidity.

OZOFORM.

Ozoform is a very strong fluid containing a larger percentage of formaldehyde than Paraform, therefore causing greater rigidity. Paraform in the first half gallon and Ozoform in the second half gallon give just the degree of rigidity that the majority of embalmers want. To produce still greater rigidity Ozoform should be used exclusively or both fluids used with hot instead of cold water.

GLACIAL.

"Glacial" is a concentrated cavity fluid which mummifies the abdomen in less than an hour and renders the further formation of gas therein as impossible as in granite. This is the strongest fluid which could possibly be made to check putrefaction and still it does not injure the tissues or instruments in any way, being non-poisonous. Repeated tests have proven that the most virulent and resistant germs are instantly killed by it. This cavity fluid should be used in all cases in which the conditions in the abdomen are bad, especially in peritonitis, typhoid fever, septicemia, diseases of the liver, deaths from childbirth, pneumonia, dropsy, whenever much gas is found in the abdomen or in the tissues, etc., and in all bodies that are to be shipped.

In the case of children below ten, if a bottle of Glacial be injected in the abdomen, one or two tablespoonfuls in the mouth, and the skin bathed with it, there will be no necessity of making any arterial injection, unless the body is swollen up with gas or to be shipped.

When a bottle of "Glacial" is in the abdomen the body can be shipped three times around the world without fear.

BALMROSE.

Balmore is a dull liniment which when rubbed on the lips prevents them from turning black one or two days after embalming, and when used on the face as massage keeps the skin soft and retains the good complexion that the embalmer has given it. Furthermore, it promotes an even distribution of the fluid in the face. After using it wipe off the excess. It is easily removed.

Every embalmer knows that in about 30 per cent. of cases the lips turn black within 48 hours after embalming. Hence the importance of using Balmrose to prevent the occurrence. No outfit is complete without it.

Price, $1.00 per tube.

ECLIPSE SOAP.

Eclipse Soap is a soft soap prepared especially for the embalmer. It cleanses the hands and leaves them as soft as velvet. It removes the bloodstains from the cooling boards, morgue tables and instruments better than anything so far known. In fact, it is a soap for the special and general use of the embalmer,—a new addition necessary to every embalming outfit.

Price, 25 cents a box.

Some Testimonials on Our New System of Embalming.

A CASE OF YELLOW JAUNDICE.

FROM THE JOHN I. NUNN CO., 2347 East. 55th St., Cleveland, Ohio.

Dear Doctor Michel:—Just a few words about and in favor of your new discovery. We think, from our experiments, that you have the best thing on the market today for the up-to-date embalmer. Your colored fluid is a producer of that life-like color that we like to see in every dead body. We are using your new system (Paraform & Ozo-Form), and the results are excellent. We must mention two cases in which your colored fluid was used. One of these was a jaundice case, one of the worst we have ever seen. It removed the entire yellowness and gave the flesh a nice pinkish color. This is the first time in all our experiences as embalmers that we have found something to help us in a jaundice case.

Fifty-six days ago we embalmed the body of a still-born infant, and at this writing the color is just the same as when embalmed, and the preservation is also perfect.

FROM J. F. MILLARD & SON, 10628 Euclid Ave., Cleveland, Ohio.

Dear Doctor Michel:—We have used your Embalming Fluids—"Paraform" and "Ozo-Form," in conjunction—as you advise—with most excellent results. On one very bad case, where the septic conditions were most pronounced, the results were very gratifying, the preservation was perfect, and the cosmetic condition fine. We consider this case an unusually severe test and do not hesitate to heartily recommend your fluids, and especially your method of using the two fluids for arterial injection.

FROM SAXTON & SON, 1550 West 25th St., and 9802 Euclid Ave., Cleveland, Ohio.

Doctor Michel & Co.—In reply to your inquiry as to how satisfied we are with your fluids we will say that we are very well pleased with them. The fluids do all that you claim for them, and we recommend them to embalmers.

FROM CLARK & BLAKE, Troy, N. Y.

Dr. G. H. Michel & Co.:

Gentlemen.—Have used your fluids on two bodies and in each case had the most perfect cosmetic effect I have ever seen in any body. After injecting the fluid even the toe and finger nails were a natural pink color and the face a delicate flush that could only be equaled by that of a live person. If your fluid proves as good a preservative in the hot weather as it is in cosmetic effect, you have any other fluid (and I have tried nearly all of them) beaten a mile.

A CASE OF YELLOW JAUNDICE.

FROM E. E. GROSS, Indianapolis, Ind., July 1, 1912.

Am glad to say that your fluid for clearing up yellow jaundice is just what it is claimed to be. I used it on a body on June 12, 1912, that weighed two hundred and fifteen pounds, and buried her on the 15th. The body had a nice, clear color, which was very gratifying to the relatives. As I had told them it was the first time I used your fluid and what you claimed it would do, they were as convinced of its merits as I was and I am glad to say so. If anyone doubts this statement I stand ready to prove it beyond a single doubt. Success to you, as it was a success to me.

FROM HENRY C. VEHLING, Indianapolis, Ind.

Please ship two more cases of fluid immediately. Your trial case proved satisfactory and bears my approval. I wish to have your fluid on hand all the time.

FROM W. E. LONGLEY, Noblesville, Ind., Oct. 17, 1912.

Your Paraform has given much better satisfaction than I had expected. Please send special price on case lots.

FROM EDGERLEY & BESSOM, Reading, Mass., Sept. 17, 1912.

We have used your fluid with the best of results. Please send us five more cases at once, as we do not want to be out of it. The complimentary remarks about the natural looks it produces make a fellow feel good.

FROM THE A. H. KELLEY CO., Wholesale Funeral Supplies, Pittsburg, Pa.

The reports we have had from your fluid have been very complimentary, and we will have no hesitancy in recommending it to our customers.

A CASE OF YELLOW JAUNDICE.

FROM FRANK F. BLICKENS, Carbondale, Pa., Nov. 7, 1912.

I have been in the undertaking business nineteen years, and in that time have used all kinds of fluids, but must admit that yours is one of the very best I ever used. Here are my experiences with your trial case:

The first body on which I used it was a jaundiced child. I injected the Carotids upward. The jaundice disappeared and was replaced with that life color that your fluid gives, and the little body looked very fine. The next case was an old lady with which I had as fine results. Then had an old man that my assistant embalmed; kept him nearly a week, and the results were marvelous. Also used it on a lady thirty-seven years old, dead of child-birth; this was a beautiful case; life appeared transparent in her face. You will soon hear from me with an order.

A CASE OF YELLOW JAUNDICE.

FROM FRED BEILSTEIN, 3311 Prospect Ave., Cleveland, Ohio.

My Dear Doctor Michel:—

I had used your colored Ozo-Form for some time to my great satisfaction when you advanced your new system—Paraform first and Ozo-Form next. I tried this and obtained still finer results. I found that the advantages you promised were realized, and shall certainly continue to practice this method. Your studies and painstaking endeavors at improving the work of embalming will no doubt be appreciated by every one trying your method, so simple and yet so effective. Your Ozo-Form once stood a very crucial test in my hands, stopping decomposition in a body which had been dead for nine days before embalming. As to the cosmetic effect of the coloring in your fluid, it has to be seen to be believed. Once, after embalming a jaundiced body, I was most agreeably surprised to find that it had changed the yellowness into a natural color.

A CASE OF YELLOW JAUNDICE.

FROM EDW. E. LINDHORST, 1610 Clark Ave., Cleveland, Ohio.

I have now been using your new method of embalming for some time with your fluids, Paraform first and Ozo-Form next, with the most satisfactory results. The coloring in them produces a very beautiful cosmetic effect,—a life-picture which could not be improved upon. I used the same on a jaundice case and I must say that for the first time in my life I was able to restore a jaundiced face to its natural color. Preservation in every case was perfect.

FROM THE HASENPFLUG-KELLY CO., East 55th St., Cleveland, Ohio.

Your new system of embalming—Paraform first and Ozo-Form next—is commendable and marks a distinct advance in practical embalming. Your colored Paraform Fluid circulates so readily and uniformly through the capillaries that it produces that life-like appearance which gives comfort to the family and arouses wonder and interest among the friends.

FROM S. A. GENTLEE & SON, Beverly, Mass.

Have used your fluid and like it very much. Please send us four more cases at once.

FROM J. D. DEUTSCH, 2404 E. 55th St., Cleveland, O.

In regard to your fluid, wish to say that I have tried it on a number of cases, and in my opinion it is the best I have ever used, and as soon as I get rid of the other fluids on hand will use no other, as the best is not too good for my trade.

A CASE OF YELLOW JAUNDICE.

FROM WM. A. NUNN, 8101 Woodland Ave., Cleveland, O.

This is to certify that I am using Dr. Michel's Fluid and find it as good as represented. It produces a cosmetic effect unequalled by any other fluid. I had a very bad case of yellow jaundice which it brought back to lifelike color, and the body looked very fine.

FROM F. ZIEHM & SONS, 6016 St. Clair Ave., Cleveland, Ohio.

We are pleased to report that we find your new method of embalming more practical and productive of finer results than other methods so far known. Your colored fluids produce a beautiful cosmetic effect, such as we had never seen before. We are well pleased with them.

FROM WM. WISCHMEIER, 2560-72 West 25th St., Cleveland, Ohio.

I have used your Fluid and Coloring Compound for about four months. Its preserving qualities and the enlivening effect it produces will prove a great benefit to the profession.

TWO CASES OF YELLOW JAUNDICE.

FROM MR. JAY P. PARRISH, 1738 E. 55th St., Cleveland, Ohio.

I have used your new system—Paraform first and Ozo-Form next—now for several months. It certainly works well and introduces an improved and more practical way of embalming. I had used your Ozo-Form alone for a long time before with invariable success, but the new method is still better. The Coloring in your fluids is really a valuable invention, a thing which had long been looked for. It makes the bodies truly life-like, which is highly pleasing to the families. I had two cases of yellow jaundice since using your fluids and in both the yellowness gave way to a beautiful flesh tint.

FROM ROTH & WEBER, 4160 Lorain Ave., Cleveland, Ohio.

We have given your system of embalming with your own fluids a thorough trial, and have obtained the very best results, more so than with other methods. We have no doubt that any embalmer who gives it a trial will use no other.

FROM STAS BROTHERS, 2000 Lorain Ave., Cleveland, Ohio.

We have tried your new system of embalming on a number of cases and found it highly satisfactory, so much so that we have adopted it altogether, discarding all other methods and fluids for your own.

FROM DRESS AND SON, West 41st St., Cleveland,

We heartily endorse your new method and fluids. Both are yielding fine results in our hands.

FROM HENRY J. DRESS, 3266 West 41st St., Cleveland, Ohio.

I have been using your Fluids for some time and should say I am highly pleased with them. Their preserving qualities and cosmetic effect are perfect.

FROM STEVEN A. JACOBS, 8923 Buckeye Road, Cleveland, Ohio.

After using your new system on nine bodies I do not hesitate to pronounce it a long step further in the field of progress. The procedure is decidedly advantageous and its results with your Colored Fluids are invariably beautiful.

LIFE-LIKE AFTER FOUR MONTHS.

August 26th, 1911.

This is to certify that out of fifty-six bodies that we have in our morgue for fall dissection, the body of Louis Klein, received April 24th of this year and embalmed by Mr. J. P. Parish with Dr. Michel's colored fluid, is to this day the best preserved and best looking of them all, being still life-like and odorless. While the other 55 bodies, embalmed with other fluids, have undergone the usual cadaverous changes and turned ashen-gray, greenish or black, Louis Klein's body has retained the natural pink flesh color unchanged.

G. P. LEONHART,
Curator Western Reserve University,
Cleveland, Ohio.

FROM C. R. DAILY, Canal Fulton, O., September 12, 1912.

Your fluid is very good. It stood some very hard tests with me.

FROM SCOTT & McCORMICK, Eaton, Ind., Oct. 12, 1912.

We had fine results with your fluid.

FROM TRAPP & GARDNER, Ripley, O., July 7, 1912.

We like your fluid very much and have had great success with it. The color is just right; it gives a beautiful complexion. We like it, and after using up some of the fluids we have in stock will re-order.

FROM G. A. WAGNER, Avon, O.

The relatives of the bodies I embalm with your fluid invariably remark "How beautiful he (or she) looks." Of course that does not hurt my feelings any.

FROM BENDER BROS., Rochester, N. Y., Nov. 6, 1912.

Please duplicate our previous order, as we have had very good success with your fluid.

FROM L. A. HURD, Sanford, Maine, Oct. 31, 1912.

I am very much pleased with your fluids—Paraform and Ozoform. They are certainly better than any other I know of.

FROM T. C. McMACKIN, Coroner, Fairfield, Ill., Nov. 1, 1912.

I have been in the undertaking business for thirty-two years; found all fluids fairly good, but yours, the last I tried, would carry the prize for the fine complexion it produces.

FROM EMERSON POTTER, Lewiston, Pa., Aug. 30, 1912.

Your fluid is working satisfactorily. Kept a woman 225 pounds for six days perfectly. Ship me three cases at once.

FROM A. E. MAUGER, Birdsboro, Pa., Oct. 14, 1912.

Your fluid is O. K. I used it in hot weather and it cleared up two very badly discolored bodies which had laid twelve hours before I got them ,and they came out fine.

FROM JOHN BRYANT'S SONS, Somerville, Mass., Oct. 5, 1912.

We like your fluid very much and endorse it. We are waiting for a jaundiced case to try it on.

FROM J. S. FREELAND, Axtell, Neb., Sept. 20, 1912.

I have tested your fluid on a number of bodies, kept them four or five days, and they looked just fine. Send me two more cases at once.

FROM JOHN A. GLIDDEN, Dover, N. H., Oct. 16, 1912.

I am quite pleased with your fluid. Please send me four more cases.

Of the other undertakers who have tried our new system and fluids recently, the following have already reported excellent results:

Monreal Bros., Cleveland, O.
John J. Hanket, Cleveland, O.
Anton Grdina, Cleveland, O.
Beckenbach, H., & Sons, Cleveland, O.
Koebler Bros., Cleveland, O.
B. Majewski, Cleveland, O.
Anton Nosek, Cleveland, O.
Chas. Steinmetz, Cleveland, O.
C. F. Horak, Cleveland, O.
The McCarthy Co., Cleveland, O.
R. E. Jones, Broad St., Columbus, O.
Pierce H. Thompson, Lebanon, Pa.
Miller Bros., Delaware, Ohio.
George J. Wagner, Avon, Ohio.
N. T. Dailey, Williamsburg, Ohio.
M. G. Veh, Gibsonburg, Ohio.
Chas. F. Baxter, Knightstown, Ind.
Nicholas Emmerling, Hammond Ind.
Thompson & Garrison, Burlington, Ind.
R. H. Wiley, Flushing, O.
A. E. Mauger, Birdsboro, Pa.
Finn Brothers, Niagara Falls, N. Y.
H. H. Brownlee, Claysville, Pa.
Bender Bros., Rochester, N. Y.
F. Roedel & Son, Camden, N. J.
W. M. Calkins, Bloosburg, Pa.
Otis K. Viall, Akron, O.
Patton & Arbaugh, Salem, O.
Chas. S. Gross, Auburn, N. Y.
Branch and Longacre, Medina, O.
Thos. E. Corrie, Bone Gap, Ill.
T. F. Reitz, Saginaw, Mich.
J. H. Hunter, Fredericksburg, O.
John F. Durkan, Scranton, Pa.
F. J. Weigand, Barberton, O.
Miller-Blanchard Co., Canton, O.
The Mellott Co., Bellaire, O.
W. L. Campfield, Barberton, O.

Directions to Use Our Fluid

Our new system of embalming, which has been approved by the best embalmers, consists of using a bottle of Paraform in the first half-gallon, and a bottle of Ozoform in the second half-gallon.

When the body is small and cannot admit four quarts arterially the last quart should be injected into the abdomen. Three quarts is the minimum that should be injected in the arteries in bodies of over 100 pounds to obtain the best results. If less than that be injected and the results are not quite satisfactory, the embalmer should only blame himself.

While the great majority of our customers follow our plan—Paraform first and Ozoform next—some of them who do not like rigid bodies prefer to use Paraform exclusively, while a few others who like to see quite a degree of rigidity opine to use Ozoform alone. We supply either kind upon demand at the same price.

Either fluid is as good a preservative as the other. Both are formaldehyde fluids, Ozoform to a greater, and Paraform to a lesser degree. The latter is, however, as strong as the former, though in a different way.

It must be remembered that in septic cases, typhoid fever, peritonitis, dropsy, and whenever the abdomen is bloated or tissue gas is present, one or two bottles of concentrated (undiluted) fluid should be injected into the abdomen.

In this case one bottle of our "Glacial" cavity fluid suffices to check putrefaction instantly. In bodies that are to be shipped, Glacial should always be used in the abdomen.

Directions to Strengthen the Color of the Fluid

Unless ordered colorless, the fluid is supplied ready for use, already colored for bodies of light complexion. An extra two-ounce bottle of Coloring Compound is included in each case, with a glass tube to measure it, to make the color stronger for bodies which require it, as follows:

For bodies of brown or yellow complexion, add one-third or one-half tubeful of Coloring to the half gallon.

For real jaundiced bodies, add one tubeful to the half gallon, or one and a half or two tubefuls if the jaundice is quite pronounced, and inject the Axillary or Carotids, not the Femoral.

The yellowness of jaundice is best removed from bodies below the age of sixty. In older bodies, if there is a pronounced arteriosclerosis, the circulation is more or less impaired and consequently the results are often less satisfactory.

If you follow our directions we assume full responsibility for all your cases and guarantee perfect preservation and a fine complexion.

To differentiate jaundice from yellow complexion see our treatise—The Scientific Embalmer.

In Regard to Young Bodies.

When embalming bodies below the age of fifteen of light complexion, especially children, we advise using Ozoform exclusively, or only three-quarters of a bottle of Paraform to the half gallon, because the latter is more highly colored than Ozoform and, if used in full strength in such bodies, is apt to make the face too pink.

A sun-tanned face must be regarded as brown complexion.

Black hair is a positive indication that the complexion is more or less brownish, though the face may not appear brown. Light hair always means light complexion.

Remember that the color to the face is given mostly by the first half gallon, that is, by the first colored bottle of fluid. The second injection, either colored or colorless, quite often does not increase or decrease perceptibly the color produced by the first injection, because the face gets nearly its full supply of fluid from the first half gallon.

The amount of coloring in our Paraform produces just the right color on the faces of all ordinary bodies of light complexion. If, in bodies of very light complexion, the face should appear a trifle too pink after embalming, use the white substance that we supply wrapped in pink paper in each case.

If, after injecting from two to three pints, no color appears on the face, add one-fourth or one-third of Coloring Compound to the balance of fluid left in the jar, and a half or three-fourths of a tubeful in the next half gallon.

If you do not get sufficient color on the face it means that the fluid did not contain sufficient Coloring Compound for that complexion.

In Ozo-Form the color is one-fourth weaker than in Paraform, so that it cannot intensify the pink tint produced on the face by the Paraform, but evens it up when it is not uniform. Hence if anyone uses Ozo-Form exclusively he should strengthen its color correspondingly.

To obtain the best color results on the face use the Axillary or brachial artery.

If desired we will, upon request, furnish the fluid colorless, and inclose in the case a larger bottle of Coloring Compound, so that the embalmer may color the fluid himself according to his liking.

As a general rule you should wet the face before injecting, or still better, use water and glycerine half and half to apply or rub on the face.

In order to produce the best color in the left hand, leave the left arm stretched alongside of the body until after injecting the first half gallon. Then bend it on the chest before injecting the Ozoform.

Our Coloring Compound can also be used externally, and it gives a more natural pink tint than any cosmetic on the market. Hence, if it happens that, in very old bodies, an even circulation cannot be obtained in the face, the color can be evened up by external application. In the same way, muddy or yellow discolorations can be easily covered up with a pink tint. To accomplish this proceed as follows:

Mix a half teaspoonful of Coloring Compound with a teaspoonful of water. Then apply this mixture to the skin with some cotton and wipe off or wash off the excess with another wad of cotton. It washes off very easily with water when diluted as above, though in its concentrated form it is not so easily removed.

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